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COVER – The vampire Lestat from *Interview With the Vampire*.
(Photograph by Francois Duhamel.)

QUICK CUTS

A NEW TWIST ON TORNADOES

warticle by Tim Prokop

When effects pioneer Arnold Gillespie found himself tasked with creating a tornado for the 1939 classic *The Wizard of Oz*, he explored a number of alternatives before opting for the inventive solution of utilizing fans to blow air through a muslin wind sock – or a woman’s stocking, depending upon the version of the story one prefers. The result proved so effective that for years afterwards the tornado footage was used as stock in a multitude of other MGM movies.

Fifty-five years later, director Jeremiah Chechik challenged Hollywood’s effects houses to create an equally effective tornado for *Tall Tale*, a Disney film which recreates the exaggerated achievements of American folk legends John Henry, Paul Bunyan and Pecos Bill. Among his many talents, Pecos Bill – played by Patrick Swayze – was reputed to be able to lasso and ride tornadoes, no easy feat to capture on film.

The task of achieving this fell to Sony Pictures Imageworks, under the guidance of visual effects supervisor Scott Anderson and visual effects producer Mickey McGovern. “Of all the sequences that we bid for,” McGovern stated, “the twister was the one we truly wanted. It is a spectacular sequence that takes place right at the end of the movie. I felt it was a great opportunity to create special effects which would have a lot of impact.”

The action takes place as eleven-year-old Daniel Hackett (Nick Stahl) says goodbye to Pecos Bill. Having given his horse to the boy, Pecos Bill is unable to take the traditional Hollywood ride into the sunset. Instead the cowboy waits while black clouds obscure the sun in an ominous portent of the tornado about to form.

Background plates for the sequence were filmed over four days – all of them cloudless – at Carbondale, Colorado, by effects cinematographer Bill Neil, who shot at dawn and sunset to capture just the right light. The clouds, and the lightning that flashes within them, were computer generated elements. Adrian Iler – under the supervision of art director Jon Townley and co-visual effects supervisor Neil Eskuri – darkened the sky and layered in digital clouds before adding hand-painted heat lightning that helped give the clouds a three-dimensional appearance.

Because the leading edge of the cloud bank is out of frame when the scene begins, the illusion of forward motion was suggested by a dark shadow that rides up the valley towards Pecos Bill. “That element was created using digital software,” stated Townley. “Hand painting techniques were used to produce a soft advancing matte that follows the contours of the valley. Then we composited a color-corrected version of the background plate and used holdout mattes to retain certain areas and make the shadow appear to climb up trees and over the back of the cottage before it drops over the characters in the scene.”

Based upon a photographic element shot on stage at SPI, the tornado that descends toward the ground was also computer generated. The film element was created using a mechanical rig conceptualized by Scott Anderson and built by Barry Walton. Air was expelled through two

vertically aligned fans across an eight-foot gap, creating a tubular vortex. Liquid nitrogen was then released at the base of this flow, causing it to expand and rise as a swirling, twisting funnel. Photographed by David Drzewiecki, this phenomenon provided an ideal basis for the tornado Pecos Bill would ride. “We took the liquid nitrogen element and used it as our jumping-off point, then stretched it and did all our CGI tricks to make it look like an actual tornado,” explained Iler. “Primarily we used it to generate the look of the outside edges, because it did not have the texture or the striations needed to convey feelings of speed and power.” An interior element was synthesized by mapping painted texture over a cylindrical shape that was created within the computers at SPI. Creating a realistic look for the edges proved particularly challenging for Eskuri and Iler who performed more than forty separate tasks before they achieved a satisfactory roiling look.

In addition to the twister, several other digital elements were inserted to enhance the realism of the shot, including the shadow of the tornado, computer generated dust as the tornado touches down and treetops blowing in the wind. “There was no wind on location so we had to isolate the treetops, cut them out and use Elastic Reality to warp them and move them around,” explained Townley. “We had to paint them out of the background before we pasted them back in so that when the trees moved they would not reveal themselves sitting there stationary – which would have been a dead giveaway.”

Pecos Bill strides determinedly toward his cyclonic steed, swinging his lariat above his head before he flings it into the whirling column of air. He leans backward, straining to hold the mammoth whirlwind as it bucks and pulls against the rope. To suggest the interaction of Pecos Bill with the digital twister, Patrick Swayze was photographed on location tugging on a rope that was attached to a tall, flexible pole. Unfortunately, the rope was pulled so taut that it generally created a straight line between the actor and the pole. “The director wanted the scene to have a wilder look,” Townley stated, “so we painted out the rope and rebuilt it from scratch using Alias software. That allowed us to move the rope in any way we wanted and show it whipping from side to side in a very active manner that was timed to match Patrick’s performance. The result was a much more dynamic scene that suggests some of the inherent difficulties of twister-roping.”

Once Pecos Bill has the tornado under control, he lets the whirlwind pull him off the ground and then hangs on for life as he spirals upward. “We filmed Patrick against a greenscreen, sitting on a crane rig that used weights and balances to raise him thirty feet into the air in a matter of seconds,” McGovern explained. “We shot a number of takes of Patrick bucking and moving around on the crane rig. It was exhausting for him because we shot a lot of takes; but he worked really hard to sell the effects – which was important since everything around him was computer generated.” Careful matting allowed the tornado texture to be layered over Swayze’s image once he was composited, effectively placing him within the whirlwind as he hurtled upward. “We used traveling mattes to give the tornado a little more of a saddle-like shape where Patrick was sitting, and then applied several layers of cloud texture and dust over and around him.” As a final sweetening element, a digital camera move was added to increase the sense of kinetic energy within the scene. The rope that Pecos Bill clings to was again computer generated to allow it to be smoothly integrated with the digital tornado.

One of the principal concerns was establishing a speed for the twister that would allow Swayze to be seen, but yet not detract from the spectacle being created. “We did tons and tons of research on twisters,” said McGovern, “and learned that they spin at almost four hundred miles per hour. It was obvious from the start that we could not create reality without tearing Patrick apart, so we had to find a compromise that would show him during the ascent and still retain the sensation of speed and power.” To find that compromise, the liquid nitrogen element was filmed at a wide range of camera speeds and exposures that allowed the effects team to experiment until they arrived at the desired look. The resulting test composite won high praise from Disney chairman Joe Roth when he saw it during greenscreen photography of Swayze. “We brought along some videotape of the twister so we could do a temporary composite for positioning. Joe Roth viewed it and said to Jeremiah, ‘There’s your movie right there.’”



Digital artists at Sony Pictures Imageworks manipulated film elements of a liquid nitrogen vortex to create a whirling tornado that descends from a storm cloud in Tall Tale.



Cowboy Pecos Bill lassoes the twister and rides it into the sky.

The twister, with Pecos Bill perched atop it, rises from the ground and merges with the storm clouds above. As the tornado disappears from sight, the clouds suddenly break up to reveal a brilliant Hollywood-style sunset – albeit one ridden into in a highly unorthodox manner. “Originally,” observed Townley, “the movie was going to close on some dialogue between Daniel and his father. But in postproduction, they ended up moving that scene before the twister sequence because they felt that this ending had more dramatic punch to it. The twister became the exclamation point at the end of the film.”



Effects supervisor Scott Anderson studies a video monitor during greenscreen photography of actor Patrick Swayze.

QUICK CUTS CLAUSE AND EFFECTS

warticle by Jody Duncan

The Santa Clause – director John Pasquin’s Christmas gift from Disney – required a variety of effects techniques and the efforts of Amalgamated Dynamics Incorporated and Buena Vista Visual Effects to create the fanciful illusion of flying reindeer pulling Santa’s sleigh through the sky. With oversight from John Sullivan, visual effects supervisor for the production, A.I designed and built animatronic reindeer for closeups, while BVVE produced puppet, CGI and bluescreen elements for shots of the animals in flight.

A.I partners Tom Woodruff Jr. and Alec Gillis had been drawn to the project primarily because of the challenge of creating a believable makeup that would transform actor Tim Allen’s trim physique into Santa-like rotundity. The reindeer, initially, were to represent only a small portion of their work on the show. “Originally,” Gillis said, “there were going to be real reindeer used, with just a closeup Comet head. As it turned out, however, the real reindeer were not very cooperative. It proved much more practical for the production to deal with animatronics than to deal with real animals.”

Because there were to be cuts between the live-action and the animatronic reindeer, Gillis and Woodruff had no choice but to base the design of the creatures on their real-life counterparts. “When Tom and I first visualized reindeer,” Gillis commented, “we thought of something deer-like and regal. But then we learned that the production had already shot plate footage of real reindeer, and that locked us into a more authentic look. Unfortunately, real reindeer are pretty ugly. They are very bovine looking, with gnarled antlers and unintelligent eyes.”

“We envisioned children running shrieking from the theater because of these monster reindeer,” Woodruff laughed. “They really are hideous looking. I suppose you could find a couple of handsome ones – the Cindy Crawford and Richard Gere of reindeer – but to find eight of them, forget it.”

Looking to enhance the aesthetic appeal of their subjects, Woodruff and Gillis made subtle changes in the design of the animatronic reindeer. “The major change we made was in the eyes,” said Woodruff. “We brought them around to the front of the face so that there would be more of an area of expression. We also configured them so that we could raise an eyebrow, or make the animal frown or smile. In addition, we cleaned up the fur and made the antlers look nicer.”

Once the design was approved, the A.I team began sculpting. “The difficulty in sculpting most animals is that you have to visualize what they’re going to look like without their fur,” Woodruff observed. “You have to exaggerate everything, because once the animal is covered with fur, you lose the detail.” Relying on measurements taken at a reindeer farm, the sculptors made a basic form that was used to cast up eight skins.

Featured in closeup, interactive scenes with Tim Allen, Comet was the only animatronic reindeer to require facial articulation. The remaining seven had only head and neck movement, with one given the additional function of swaying hips to suggest body movement. "Whenever a shot featured all eight of the reindeer," Woodruff commented, "the camera was so far back that a simple movement of the heads was enough to sell the fact that the whole team was alive." Comet's facial articulations were radio controlled. "The eyes were able to move and blink. We also worked in a squint by having his cheek come up and his eyebrow come down. Around the mouth we had to find a mechanical configuration that would make him able to smile yet still be able to open his mouth in a natural way. It also needed a side-to-side chewing movement." Though fitted with approximately twenty servos, Comet also had a separate cable-operated neck mechanism that was incorporated into the other seven reindeer as well. "Mike Elizalde was responsible for a lot of the articulation in Comet's face. Yancy Calzada, his assistant, worked primarily on the background neck mechanisms."



On Christmas Eve, Santa makes a rooftop landing in a toy-laden sleigh drawn by eight computer generated reindeer created by Buena Vista Visual Effects for The Santa Clause.



For scenes of Santa interacting with his team, full-size reindeer were created by Amalgamated Dynamics Incorporated.

After the mechanical understructures were skinned, fur was applied by Karen Lafler, Heidi Snyder, Joanne Bloomfield and Kathy MacDonald, then painted by Andy Schoneberg and Brent Armstrong. “We had five different kinds of synthetic fur for different areas of the body,” Gillis explained. “When the fur work was finished, the animals still looked like stuffed toys. We used acrylic paints or dyes to airbrush colors onto the fur, brushing it as we went to create a blend so that we didn’t wind up with the *Teddy Bear* syndrome of distinct white patches against distinct brown patches. Then we used ink markers to break it up even more.”

For A.I., the challenge of *The Santa Clause* was creating reindeer that walked the line between realism and whimsy. Realism was also what Buena Vista Visual Effects was instructed to strive for – a difficult goal to achieve considering the company was tasked with creating something as inherently unrealistic as flying reindeer. “The director had told us that he wanted the reindeer to look as realistic as possible,” noted BVVE effects producer Carolyn

Soper, “but since reindeer don’t really fly, there were hypothetical problems that needed to be addressed. How would a reindeer take off or land? Do reindeer move their legs when they fly? If so, how much? We had long discussions about such things throughout postproduction.”

BVVE determined that a digital reindeer team would suffice for wide shots. “We knew CGI would work at a distance where you couldn’t make out detail,” Soper affirmed. “For closer shots, though, we planned to shoot live reindeer, then composite them to build up a team of eight. By the time we got the assignment, however, it was about a week before every reindeer in the world was going to lose its antlers, so we had to quickly shoot real reindeer bluescreen, covering all the angles we thought would be needed for the flying shots. The next day, the antlers fell off. We put the first shot together, compositing the reindeer into a live-action plate, and it was very successful. But when John Pasquin saw it, he realized that what he really wanted was something more whimsical.”

To augment the live reindeer, Rick Lazzarini of The Character Shop had been commissioned to build a small-scale puppet. “As it turned out, the puppet didn’t match what A.I. was doing with their animatronics and it didn’t match what the director wanted, so Rick had to change his reindeer by slimming it down and completely resculpting the face.” The revised puppet was two feet tall and two feet long, with a rod-operated head and motion-controlled legs. “We shot the puppet against bluescreen. There was only one to represent all eight reindeer, but it had several different sets of antlers so we could change the look of it a little bit. We would also change the speed of its gait from shot to shot. After shooting several elements, we could take two or three of those different pieces and clone them to make a team of eight individually moving reindeer.”



Augmenting the digital and animatronic reindeer was a motion controlled puppet built by The Character Shop.

Concurrent with the puppet work, BVVE's computer graphics team – headed by Aaron Campbell and Lee Lanier – was engaged in building a digital reindeer for use in wider shots. “As the CG team progressed, however, we became more excited by the prospect of using CG for the closer shots also,” explained Soper. “The limitations of the puppet approach were becoming obvious. With CG you can take your wire-frame model and change it according to the specifics of a shot. If a reindeer is flying towards camera, the CG artist can concentrate on the face of the model and not worry about the back. But a puppet has to be built so that it will work for all of the shots – which means compromises must be made. So we found that the CG was actually turning out to be more successful in the closer shots than the puppet.”

With the decision to use CGI more prominently, BVVE had to address the problem of creating digital fur. “We shot some high-quality closeups of the fur on the animatronic reindeer,” Soper recalled, “and scanned those elements in to use for our texture. We used a customized 3-D paint program to paint what we needed and then wrapped that around the model so we wouldn't have to go in and render individual hairs.”

The final film features two puppet and two live reindeer composites, plus eighteen computer graphics shots. “What we learned through this whole process,” Soper concluded, “was that we didn't need to be so cautious with the CG. In fact, we would have done more CG if we'd had time. But we were up against a hard deadline – no one was going to delay Christmas this year just for us.”

SPECIAL VENUES

INSIDE THE LUXOR PYRAMID

article by Louis M. Brill

Amidst the neon glitter of hotel facades, casino floor shows, dinner theater acts and arcade attractions, the distinct shape of the Luxor pyramid – a hotel/casino that recreates the splendor of ancient Egypt – rises out of the Las Vegas desert and truly shines with a light of its own. The building projects a light beam that reaches ten miles up into the sky and on a clear evening can be seen – so they say – at cruising altitudes above Los Angeles.

Luxor was built by Circus Circus Enterprises, the largest and most profitable gaming organization in the country. A thirty-story pyramid guarded by a ten-story sphinx, Luxor represents the height of magnificent excess. Complete with complementary murals, statuary, columns decorated with hieroglyphics, a river tour of ancient Egypt and the pyramid apex with its penetrating light beam, Luxor is as much a celebration of ancient Egypt as it is a modern-day hospitality center. Visitors enter through the front of the sphinx and encounter the hotel's interior space which, at twenty-nine million cubic feet, is the largest interior atrium of any building in the United States.

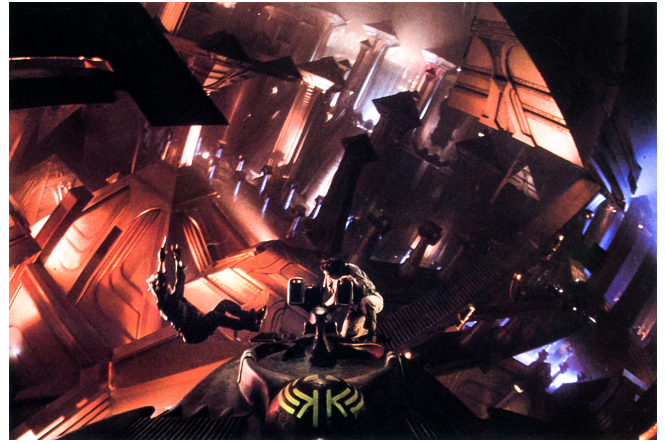
Within the architectural splendor of Luxor is a high-tech, urban entertainment center that boasts a series of attractions entitled *Secrets of the Luxor Pyramid* which collectively recount the story of characters competing for ownership of a magic crystal obelisk. On one side is Dr. Carina Wolinski (Marjorie Harris) – whose talent for deciphering ancient hieroglyphs enables her to track down the mysterious artifact – and Mac MacPherson (Michael Corbett), an entrepreneur who owns property upon which is discovered an access route to an ancient underground pyramid. In exploring the pyramid, Carina incurs the wrath of Dr. Reginald Osiris (S.A. Griffin), a cult leader of the Enlightened Society for Global Transformation who feels the underground pyramid and its mysteries rightfully belong to his organization. In the ensuing race to discover the obelisk's secrets, Carina is kidnapped repeatedly by Osiris while Mac strives to rescue her and set right matters concerning ownership of the obelisk and its place in human destiny.

The story unfolds in three separate attractions which employ several disparate media formats. The first is *In Search of the Obelisk*, in which guests learn that during the hotel's construction, a secret underground chamber was discovered. In the spirit of Las Vegas showmanship, the chamber has been opened into a 'subterranean' attraction. Guests are invited to visit the attraction and, as they descend to the site of the archeological discovery, their 'elevator' breaks down and they find themselves in a classified research area where they are advised they will be promptly evacuated. Once inside a simulator vehicle, however, they are diverted in a chaotic chase after Osiris. The second episode, *Luxor Live*, is a multimedia show incorporating a live performance with theatrical illusions, a Showscan rear projection program, video projections and a computer generated 3-D film experience. The secret of the obelisk is at last revealed in the final attraction, *The Theater of Time*, an auditorium of tiered balconies reaching seven stories high, with an equally tall vertical movie screen upon which the final film presentation is shown.

The three-part Luxor attraction was conceived and directed by Douglas Trumbull and co-directed by Arish Fyzee. The Trumbull Company – located in Lenox, Massachusetts, and now a subsidiary of Imax Corporation – coordinated the design and production of the live-action and film effects, as well as managing construction of the theaters that would house them. The aura of grand adventure in the attraction is reminiscent of other projects that bear the Trumbull stamp of visual effects genius, including such works as *2001: A Space Odyssey*, *Close Encounters of the Third Kind*, *Blade Runner*, *Star Trek: The Motion Picture*, and his own films, *Silent Running* and *Brainstorm*.

Beyond his accomplishments as a visual effects designer, Trumbull has advanced the ride simulator as an audience participatory film experience. In 1974, one of Trumbull's early companies, Future General Corporation, achieved two major breakthroughs in simulator rides with the invention of the Showscan process – which presented 70mm film shot and projected at 60 frames per second – and the development of the first modern ride simulator prototype, which won the International Association for Amusement Parks and Attractions' annual award for best new idea in entertainment. The concept was further refined at Showscan Film Corporation, Trumbull's succeeding company. Tour of the Universe, a Showscan venture created under the direction of Interactive Entertainment – now called SimEx – was the first permanent simulator ride attraction housed in its own dedicated theme park. Another triumph was the Showscan installation at Canada Expo '86, a maritime attraction entitled Deep Sea Rescue. Trumbull's continued success in developing the art and science of ride simulation culminated in his next showcase extravaganza, Universal Studios' *Back to the Future* ride, one of the most acclaimed movie rides in the world.

The level of achievement Trumbull attained with the *Back to the Future* ride was not lost on the management at Circus Circus Enterprises when it came time to develop a stunningly scaled living cinema center for their new hotel. "The mandate from Circus Circus," Trumbull said, "was to create three attractions that represented the past, the present and the future, and relate them in some way to the Luxor pyramid. Our take on this was to create a feature film presented as three separate episodes in three equally different movie formats, but all linked together as one continuous story. We wanted to make a statement with this project that we could go another step beyond *Back to the*



A high-speed simulator ride through an ancient pyramid highlights the first of three attractions designed and built by The Trumbull Company for the Luxor Hotel in Las Vegas.



Advanced modelmaking techniques were employed to create the small-scale, yet highly detailed, miniatures needed for the film ride.

Future – and not just be a gimmick, but the beginning of a maturing kind of film industry offshoot. We wanted to explore the world between a ride and a feature film, which we perceive as a high entertainment center that's a new kind of indoor theme park. It's not roller coasters, merry-go-rounds or flume rides. It's high technology media entertainment delivered in a new way with new criteria as to what it shows and for how long." Trumbull envisioned the first part of the film trilogy, the four-minute *In Search of the Obelisk*, as a ride simulator experience with well-developed characters and a fully-realized plot line. "This was the first time we could make a movie ride in a dramatic *Indiana Jones* kind of adventure," said Trumbull, "with dialogue, character development, a beginning, middle and end, a fight scene and a big rescue scene. There's a lot packed in there for a four-minute film. Normal movies haven't even finished their opening credits by the time we're done. The compacting of time in this film, and your perception of time and space, is choreographed right down to the frame."

Concepts for the look of the film began with art director Tom Valentine. "When I first came on board the project," Valentine recalled, "production designer Bob Taylor and staff artist Tom Molinelli had completed a set of storyboards. A big part of the ride was going to involve a wild flight through a mammoth interior space that we called the puzzle room. The puzzle room was to be an architectural obstacle course with pyramids, inverted columns, stairways going nowhere and reversing floors and ceilings. Since the space was to appear almost limitless in all directions, with a field of view of more than 150 degrees, it seemed both a staggering proposition and a great opportunity to do something really wild."

Once the overall design for the movie ride had been devised, the Trumbull team began previsualizing the miniatures using computer-aided design tools. "We first built miniatures as computer models," said Trumbull. "We created blueprints with exact dimensions of individual parts and were able to translate these detailed specifications as numerical instructions to computer-aided systems such as milling machines or the Lasercamm, which created the actual model parts and then cut them out."

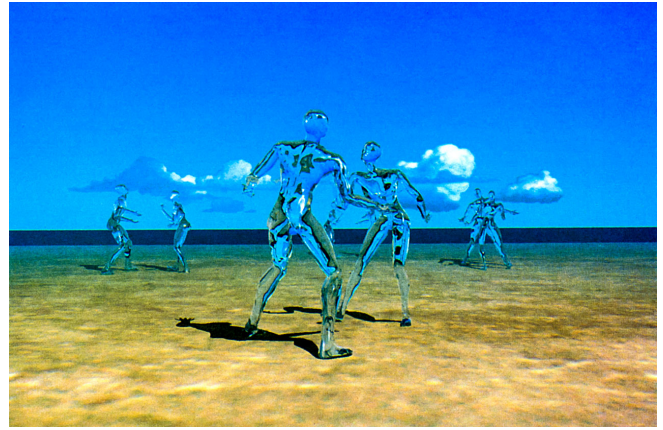
With an oversize film format and frenetically moving camera, small but highly detailed models were a must. Having used miniature sets for the *Back to the Future* ride, Trumbull was familiar with the pitfalls of building small sets that would still allow proper access for a motion control camera system. "Most of the miniatures in *Back to the Future* were one-inch-to-the-foot dollhouse scale," Trumbull explained. "That scale worked out pretty well, but it meant that some of the miniatures were sixty feet long – and we used up that sixty feet in a twelve-second cut. So I wanted to make the miniatures smaller in the Luxor project and of a finer detail. We were able to do so because the CAD/CAM process could create delicate model parts faster than a model craftsman could do manually."

Three major miniature sets were required for Search – a chasm model, a pyramid altar and the puzzle room. “I had a work crew that ranged from fifteen to about thirty-five modelmakers at the height of our construction frenzy,” said miniature supervisor Mark Stein. “In total, it took us about nine months to build the models required for all three attractions.”

Key modelmaker David Merritt coordinated the construction of the puzzle room miniature. When completed, the room was about twenty-eight feet by thirty-two feet by nine feet. “Our biggest consideration in building the puzzle room was that it consisted of hundreds and hundreds of individual parts made up to fit like a Lego set,” Stein recalled. “All these parts needed to be hollow so we could put internal lighting inside of them. We went to an outside vendor, a company called Mannetron, that specialized in a technique called rotational molding which was a way of economically producing huge numbers of parts that were hollow and finished on all sides.”

After receiving the puzzle room pieces from Mannetron, the Trumbull modelmaking crew did finishing work, cleaning up the parts and painting them. “We had many instances,” said Stein, “where we needed hieroglyphs etched into stone walls. Most modelers would sculpt styrofoam or urethane foam to look like a stone wall. In our case, under the direction of key modelmaker Steve Thurn, we had templates with all the glyphs cut out of them, and then sprayed Krylon Crystal Clear through the template and let it eat through the foam and etch out perfectly carved hieroglyphs.”

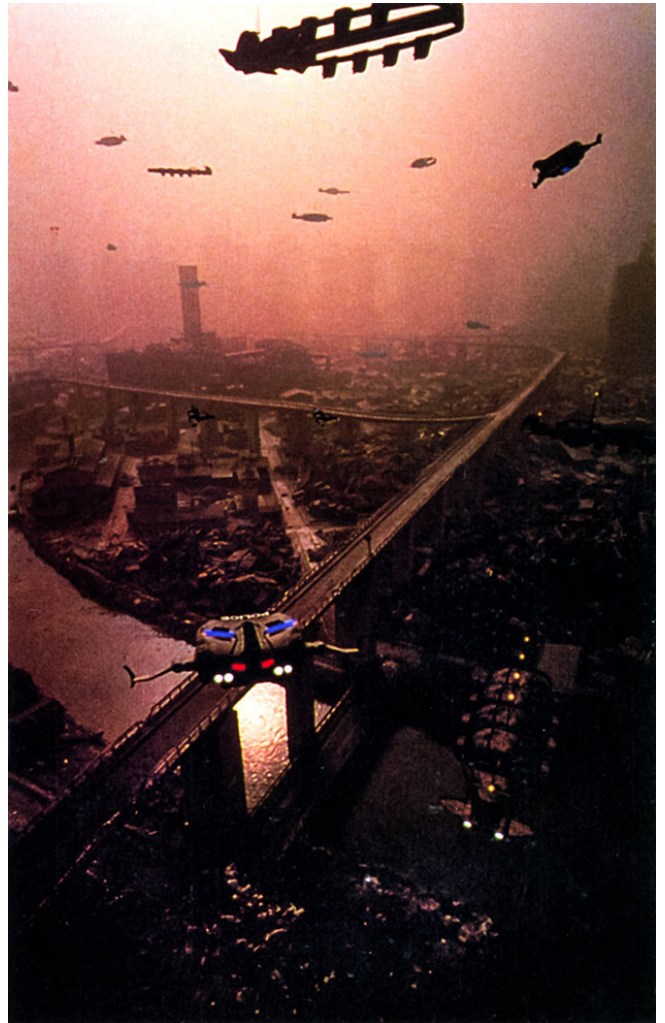
Another version of the puzzle room was needed in a forced perspective format designed to look as if its massive interior went on ad infinitum. “We made the entire room out of three-ply Bristol board and copy paper,” Stein related. “We took the copy paper and sprayed it with lacquer paint, took hard copy artwork and xeroxed it onto this prepared paper. We mounted the copy paper onto the Bristol board, cut to shape on the Lasercamm. It gave the impression of a room with a tremendous amount of depth.”



The second attraction featured a computer generated 3-D film produced for Trumbull by Kleiser-Walczak Construction Company.



The second attraction featured a computer generated 3-D film produced for Trumbull by Kleiser-Walczak Construction Company.



The third attraction – a film journey into futures both good and bad – was produced for projection onto an enormous vertical screen.

Once the miniatures were finished, they were brought to the shooting stages for motion control photography. Studio I was fitted with a ceiling-mounted gantry system which ran the entire length of the stage. Studio III contained a vertical boom-mounted system for filming descending and pull-away shots. Operated by David Hardberger, the boom camera was utilized for sets that required the camera to overhang or go into models that were positioned sideways for more controlled motion photography of vertical ascents or descents.

Doug Smith director of motion control photography, employed ultra-compact Vistavision cameras – built by Ron Schmidt – on the two motion control platforms. “The photography was very tightly choreographed,” Smith commented. “There were very definite time constraints as to where we had to be and when we had to be there with the camera. The puzzle room was a miniature with a tremendous amount of three-dimensional space. Usually if you’re flying through a miniature landscape it’s basically two-dimensional – it may rise up and down, but it’s still essentially a flat surface. In the case of the puzzle room, we had pillars, columns and bridges, things to fly under, around and through. The entire space was filled up with models and with slots for our gantry periscope to go through. At some points, the camera would see almost 360 degrees as it panned all the way around. The whole process was very demanding on both the camera system and the models.”

Combined with the miniature backgrounds were computer graphics elements provided by Kleiser-Walczak Construction Company. “When Doug came to Los Angeles seeking assistance with computer animation for the Luxor project,” said co-owner Jeff Kleiser, “he went to all the big companies in town. When he came to us, we argued that because he was planning to integrate composites of computer animation, live-action and motion control photography, he really needed to put it all under one roof. We told him that we would assemble a team of people, put them in his facility in Lenox, and for the duration of the Luxor project our special team would be dedicated to him, not working on anything else. We would be able to come downstairs and measure the models and the cameras and put tests together and work with his other teams on a daily basis.”

Once established in Lenox, Kleiser-Walczak set up a computer graphics department equipped with numerous Macintosh computers, two Silicon Graphics Crimson computers, twenty Indigo R4000 workstations, two Solitaire film recorders and two IBM PVS supercomputers. “Powerful computers are now small enough that we can pack them up, put them in a van and drive them from client to



The third attraction – a film journey into futures both good and bad – was produced for projection onto an enormous vertical screen.

client,” Kleiser observed. Wavefront Technologies software was employed for model building, animation and rendering processes, while PhotoShop was used with the Macintosh computers for painting texture maps and creating soft airbrush effects.

Kleiser-Walczak’s contribution to *In Search of the Obelisk* ranged from full computer graphics scenes to insert composites of shuttlecraft flying by. “There was a sequence where the simulator vehicle enters a vast chasm a mile across,” Kleiser stated. “We recommended to Doug that we do the scene using CGI because of the tremendous cost of building a model large enough to indicate that sort of scale. There was also the difficulty of flying a camera around and choreographing a very complicated dogfight in a small space. He agreed, so we set out to create a CGI chasm sequence – which turned out to be a one-minute fly-through of that area.” During the remaining three-and-a-half minutes of the ridefilm, there were also computer generated aircraft, missiles and exhaust plumes that were matted into the miniature photography to mask transitions and create the impression that the entire film was done as a single, continuous take. As live-action, motion control and computer graphics elements were completed, they were sent to Trumbull’s digital compositing department where they were composited into a final image that was outputted back as film.

Film elements followed a circuitous path from The Trumbull Company to the Cinesite Digital Film Center in Hollywood where individual frames were transformed into 4K x 6K high-resolution data scans. A total of 38,000 Vistavision frames were scanned thus and returned to Trumbull for further massaging in the IBM PVS supercomputers. “Once we received the scans from Cinesite,” digital compositing supervisor Serge Sretschinsky explained, “we used software that would shrink them down to our 4000-line working resolution, allowing us to enhance resolution, deal with color corrections and bluescreen, and finally do the composites as required and then output the results to our on-site Solitaire film recorder.”

“The main compositing challenge,” observed visual effects supervisor Joel Hynek, “was the integration of the monolev driver with the continuous, yet varying backgrounds of the film. In this ride attraction, the Luxor guests are seated in a motion simulator which appears to be towed by the monolev. The monolev pilot, Mac MacPherson, interacts with other characters, structures, explosions, CGI, shadows, et cetera, all throughout the four-and-a-half-minute ride. The actor was photographed bluescreen in seven different takes – but it appeared to be one continuous take when those bluescreen elements were composited over the underground chamber environment.”

The digital compositing team was also charged with matching live-action with computer generated imagery. Adding to the challenge was the fact that the live-action was filmed with a fish-eye lens to match the hemispheric screen of the ride simulator. “All live-action motion control filmed with the fish-eye had the classic curved optical distortion,” said Hynek, “so anything visually above the



A motion control gantry camera glides over a futuristic utopian miniature constructed for the third Luxor attraction.

horizon appeared to be bending like a big bow – high in the center, low on the sides – and anything below the horizon was bending the opposite way. It was as if you were using a 7mm lens on the sides of the frame and a 16mm lens in the center.” Kleiser-Walczak’s digital imagery was photographed by a ‘virtual camera’ that initially produced flat images. To evenly match scenes between their work and the live-action, Kleiser-Walczak had to come up with a whole new software system – developed by Frank Vitz – that rendered the images from three different camera views that were then blended together.

In Search of the Obelisk climaxes with a chase that leads Mac and his unwitting passengers to the pyramid altar where the crystal obelisk is finally discovered. In a struggle to possess it, Osiris pushes Carina off the altar and into the surrounding abyss. Without hesitation, Mac navigates the monolev into a plunge downward to overtake and rescue Carina from certain death. Construction of the set was supervised by key modelmaker John Merritt. “It was a three-dimensional model that had a lot of wild walls with layers of architectural environment,” said Mark Stein. “Every element had to be carefully planned so that the finished model would fit on the stage and allow for access with the boom camera. It was a huge model.”

The pyramid altar was photographed motion control to facilitate its blending with shots of the actors performing the fight and fall sequences on a full-scale partial set. “There was a complicated sequence of miniature motion control and realtime live-action where we had two people fighting on a full-scale set which was composited onto our miniature set,” Hynek explained. “During the fight, Carina is knocked off the pyramid altar and does this huge tumble. For the tumble, Marjorie Harris was put in a wire harness and shot bluescreen; but she was never dropped more than twenty feet away from Mac. In post, we were able to separate her more, reduce her image and move her around in the frame to simulate her fall, recovery and rescue. This move was not only a masterpiece of digital compositing, but also a tribute to our previsualization process. Terrance Masson, a member of our digicomp group, simulated the entire sequence before we filmed the bluescreen. Using previsualization, we figured out the right perspectives and what our photographic requirements would be to film Carina’s aerial maneuvering.”

Soon after the rescue of Carina, In Search of the Obelisk comes to an end. The saga continues in the next attraction, Luxor Live, in which guests enter a talk show set surrounded by stage lights, giant video and film screens, and a crew of live technicians, including a stage director. The talk show itself – host and guests – was a Showscan projection seamlessly blended into the set.

Slated to appear on the show via remote from Egypt is Carina who is studying some ancient ruins in conjunction with an imminent solar eclipse. As the phenomenon begins, Carina experiences a vision which is presented to the audience through a computer generated 3-D film projection known as the dream sequence. The dream sequence begins with a series of geometric and organic holographic images which evolve into transparent computer generated figures dancing on a beach. The dance soon transforms into a warlike confrontation which ends in a cataclysmic explosion.

The 3-D aspect of the dream sequence made it a particularly challenging computer graphics assignment. “We not only had to be able to position the images on a screen,” Jeff Kleiser related, “we also had to position them in three-dimensional space. Our director of software, Frank Vitz, wrote some specialized software that allowed us to use StereoGraphics’ CrystalEyes 3-D glasses, which are

a very high-end LCD shutter type glasses. These glasses were critical in composing the sequence, because without them we would have had no idea where all our CGI images were going to converge in space along the z-axis. We also needed to decide how far out in front of the film frame we could safely converge images so that the average audience could see a well-defined 3-D image. If you go too far out, you lose sight of the image – and if that happens you start to lose your audience.”

The cumulative effect of highly-realistic 3-D projections integrated with live-action is that the audience experiences what appears to be a live event happening around them, as opposed to a filmed episode. “In Luxor Live,” stated Trumbull, “there is a manipulation of the audience’s experience as to what is real and what is not. The idea behind the show was to tweak the audience’s curiosity, to telegraph the idea that the presentation for the most part is an illusion, letting them scrutinize that idea somewhat closely. Many audiences sitting through the talk show completely bought into the idea that the show was real. We polled audiences leaving the theater, and many failed to realize they had been looking at projections.”

In the third attraction – The Theater of Time – audiences enter a steeply raked auditorium comprising seven levels of seating and a vertical Vistavision screen seven stories tall. “I wanted to create a real sense of vertigo for the audience,” Trumbull said. “So we created a vertical theater that would allow an audience to look down at the screen instead of across a room as they do in more conventional movie theaters.”

In the context of the story, the theater represents the passenger bay of a time travel machine under the control of Dr. Osiris. Osiris gives a short welcoming speech, introducing the time machine and inviting the audience to come with him into the future. He is joined by Carina and Mac, who are again in possession of the obelisk – which, not coincidentally, is the energy source which drives the time machine. Once underway, they discover a futuristic city in dreary disrepair.

Inspired to save the city, Osiris kidnaps Carina and takes possession of the magic crystal, vowing to change the future for the better. Locked inside the time machine, Mac journeys further into the future and finds the city growing progressively worse with each leap through time. Realizing he must change this grim course of history, Mac turns the time machine around and re-encounters Osiris, rescuing Carina and leaving the doctor alone in the city without the magic crystal. Traveling forward once again, Mac and Carina discover the results of their interference – a utopian society living in a perfect city of the future.

As with the ridefilm segment of the Luxor trilogy, The Theater of Time was realized through a combination of miniatures, computer graphics and live-action. The model assignment entailed building a series of vast cityscape sets which were photographed motion control on the gantry stage. Computer graphics enhanced the vistas and provided several hundred aerial vehicles flying above and through the towering buildings. “Essentially we built five future city sets in two different scales, some for large establishing shots and others for closeup work,” explained Mark Stein. “We named the future cities ‘good,’ ‘crummy,’ ‘bad’ and ‘very bad.’ The bad city was redressed for the very bad set; so we didn’t have to build a new model for that one. Good, crummy and bad were built in one-sixteenth-inch-to-the-foot scale and were used for master shots. Good and bad were also built at one-eighth-inch-to-the-foot scale for closeup work.” Each city was constructed with a basic cookie-cutter approach and then fine-tuned. “We started each set with large metropolitan-type

buildings which we built up into several different levels of city skyline with many different four-by-eight-foot sections assembled together. The assembled sets were about twenty-eight feet by thirty-six feet, with the tallest structures rising to a height of about forty-eight inches.”

Photography of the future city segments was complicated by the vertical aspect ratio realized by turning the Vistavision camera on its side. The unusual format established an auditorium perspective where some viewers would be looking up at the film while others would be looking down. Creative framing was thus essential. “In filming the future city sequences,” Doug Smith noted, “we kept each set’s horizon fairly high in the frame to give audiences a sense of vertigo as they flew over the landscapes. Because the Vistavision screen was so tall, viewers were able to look straight down the sight line below where they were sitting and still see the movie.” Digital spaceships, aircraft contrails and, in the ‘very bad’ sequence, laser beams and missile strikes from aerial battles were Kleiser-Walczak contributions. “We had our spaceships firing laser beams down on the very bad model,” observed Jeff Kleiser, “syncing up with practical flash effects that were shot during the motion control photography.”

In the finale of *The Theater of Time*, Carina and Osiris grapple on a rooftop – a live-action segment incorporated into a miniature rooftop set. “We had a rooftop that measured about three inches by three inches,” Smith explained. “Our actors are abandoned on the rooftop when the craft they were in departs. We see them diminish in size and the rooftop getting smaller as the camera takes off like a helicopter. To create this scene, we first shot the miniature with the camera rising up to reveal the entire cityscape. That shot had an exposure of about one second per frame and took a half hour to photograph. We then took the data from the miniature move and scaled it up so that the camera would move the proper distance when the actors were filmed.”

Given the rising popularity of film-oriented theme park attractions – not only in Las Vegas but throughout the world – those working within this relatively new industry can only speculate as to its future. For now, *Secrets of the Luxor Pyramid* has broken new ground in film and multimedia attractions, and has opened the door to a new era in film exhibition. “With the Luxor attractions,” Douglas Trumbull concluded, “we have bridged the gap between technology and storytelling to create an experience that is emotional, accessible and personally involving. Thanks to our evolved media technologies, the proscenium arch has been penetrated, permitting the audience to go from being the object of a movie to being the subject of one.”

QUICK CUTS SANTA'S HELPERS

article by Estelle Shay

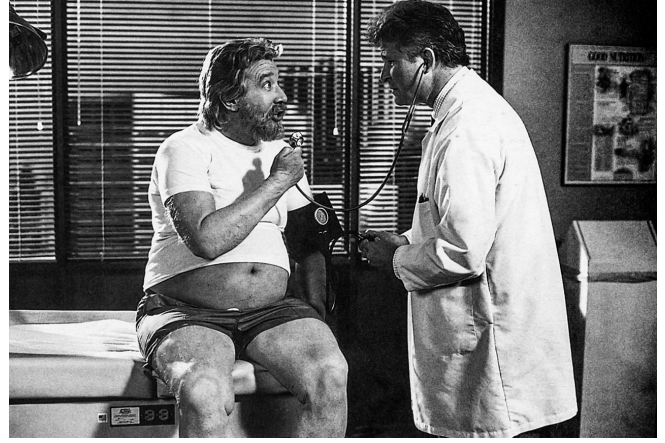
The comedic talents of Tim Allen, television's favorite handyman, coupled with an amusing premise and special effects sleight-of-hand, proved an unbeatable combination for Walt Disney's holiday release *The Santa Clause*. The movie features Allen as full-time cynic and part-time dad Scott Calvin, whose life undergoes a remarkable change when Santa is killed in a fall from his roof and marketing executive Calvin inherits the job.

Essential to the film's comic premise was the gradual metamorphosis of the unwitting Calvin into a fat, jolly St. Nick – a task undertaken by the Amalgamated Dynamics team of Tom Woodruff, Jr. and Alec Gillis. The duo spent three months preparing for the considerable demands of the project. "Our goal in designing the makeup," noted Gillis, "was to create character within a realistic realm. What impressed us when we read the script was not just its humor, but that it gave logical reasons for how Santa operates. In keeping with that, we felt it essential that the Santa Claus makeup be seamless so that you totally believed the changes that were happening to Scott Calvin."

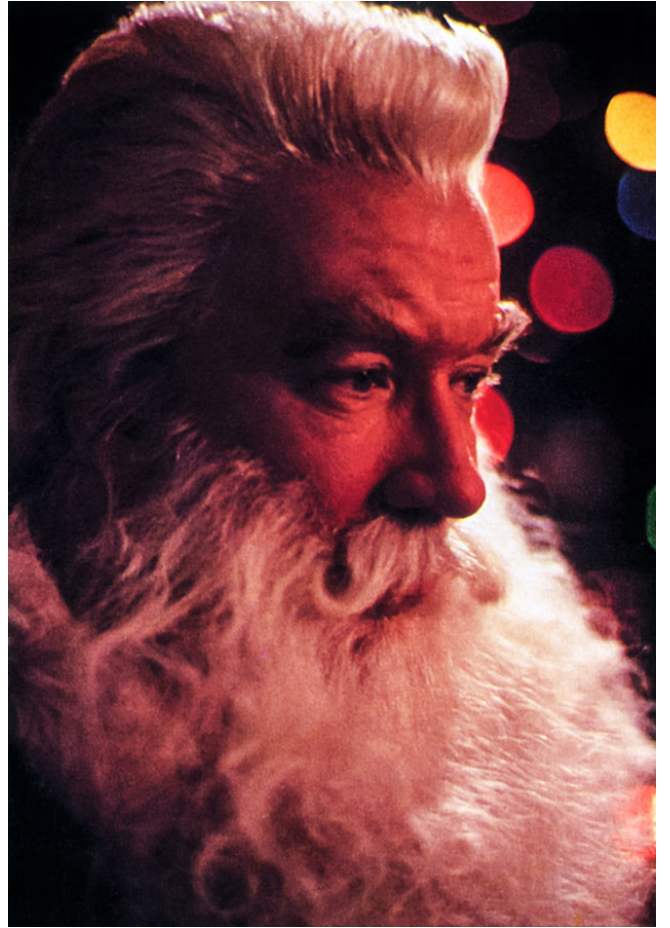
To achieve the transformation – which occurs over a period of a year – Gillis and Woodruff developed six stages of makeup, ranging from simple tufts of graying hair to the full-blown 260-pound Santa rendered with the aid of facial prosthetics, wigs, beards and a full body suit. In-between stages entailed changing hairpieces and eyebrows, under-the-clothing fat suits to add varying degrees of weight, and a range of facial and body appliances. Working as project coordinators were Yuri Everson and Andy Schoneberg. Appliances for all of the stages were sculpted by Schoneberg, Tom Floutz, Greg Smith and Norman Cabrera.

The initial employment of appliances was for a sequence in which the mysteriously overweight Calvin walks in on a strategy session and attempts to explain his sudden weight gain to colleagues as a reaction to a bee sting. This stage of makeup consisted of an appliance piece that left much of the actor's face exposed. "It went over his head and covered his entire neck, sort of like a dickie," explained Gillis, "leaving his chin, upper lip, nose and forehead showing. Although we knew it might make the application more difficult, we chose to go with one big piece rather than a lot of overlapping appliances, which take more time to mold in the shop and apply on set due to all the edges you have to deal with. Also, when you have several pieces with glued overlapping edges – as opposed to solid foam – it limits mobility." For subsequent scenes – including one of Calvin shaving and another in which he chases Federal Express workers who have just delivered hundreds of boxes of Christmas lists – a fuller facial appliance was used.

Another stage occurs during a scene in which Calvin seeks medical advice regarding his perplexing weight gain. “That was a particularly complex makeup,” recalled Woodruff, “requiring the application of leg, arm, chest and belly appliances.” Although leg and arm appliances were cast up in traditional foam latex, the A.I team considered a number of other materials to create the protruding belly that had to move ‘like a bowl full of jelly’ as Calvin performed a treadmill test. “We thought about using a urethane substance called Flabbercast – which Lance Anderson and Kevin Haney used on *Death Becomes Her* to do Goldie Hawn’s fat suit – but it really didn’t move the way we wanted. We also considered Skinflex – a translucent material with a real waxy, skin-like quality – which we used on *Alien 3* for our Bishop animatronic head. But Skinflex also has limitations – it is not that strong and it tends to yellow quite quickly. Then we turned to silicone. We had been doing a lot of R&D with silicones, and on *Death Becomes Her* had actually figured out how to paint it successfully – something people have been trying to do for years. But silicone has a drawback, too, in that it tears easily. Finally, a representative from one of our suppliers – Fiber Resin Corporation – came in with a block of clear, gelatinous stuff. He said, ‘I know you’re always experimenting with new materials – is this something you can use?’ We looked at it, shook it and thought, ‘This is our Santa belly!’”



A marketing executive (Tim Allen) turns obese, practically overnight when Santa dies in a fall off his rooftop and The Santa Clause is invoked. Amalgamated Dynamics simulated the weight gain with full-body prosthetics.



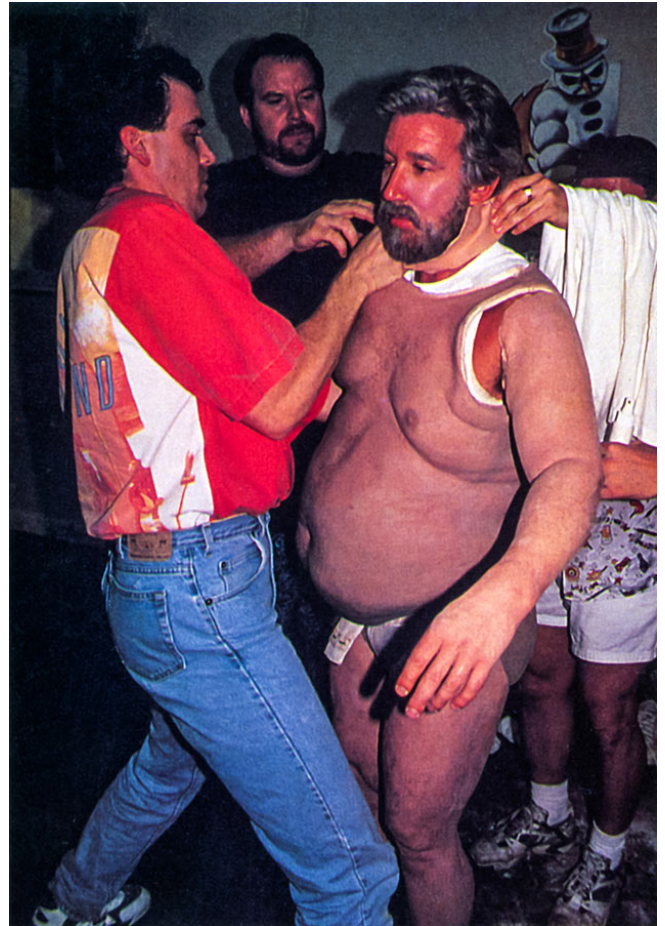
Final-stage makeup. / Tim Allen is suited up for his Santa Claus role by Tom Woodruff and members of the A.I crew.

Still too new to be named, product #HL2249 – a variation of hot-melt vinyl made entirely of nontoxic, natural rubbers – required a considerable investment in equipment. “We had to purchase an injector melter,” Gillis recounted, “which melts the latex down to a precise temperature of 400 degrees, then pressurizes it and injects it into the mold. We also purchased a giant oven and used all high-temperature epoxy molds because they, too, had to heat up to 400 degrees.” Mold shop supervisor Yuri Everson was charged with producing the epoxy molds. “Even though epoxy is more costly and time-consuming than plaster or silicone,” Gillis resumed, “it heats up quicker and also has a very low shrinkage rate. That translates into superior edges and a much greater retention of detail than you get with plaster, which tends to degrade and powder after just one baking. Even though we required as many as sixty runs from a mold, we found that one mold was sufficient for the job.”

The gamble of using the new material paid off when the first casting was tested. “We grabbed a guy about Tim Allen’s size,” Woodruff recalled, “threw it on him and ordered him to do jumping jacks. It just looked phenomenal – right out of the gate.” Delighted with the material’s performance, Woodruff and Gillis are experimenting with other applications for its use. “We’ve done some testing with animatronic skins and found it to be stretchy, water clear and very much like flesh in its movement characteristics. Plus, you can paint it with acrylic paints. We’re now exploring its usefulness as a material for translucent makeups.”

For the complete Santa transformation, the final stage makeup utilized full body prosthetics – arm and hand pieces, leg appliances and the belly – along with facial prosthetics akin to those used earlier to add fullness to Allen’s face. “In addition,” commented Gillis, “we added a forehead piece after studying some of the old Norman Rockwell Coca Cola Santas. One of the things we noticed about them, and about babies and children in general, is that their foreheads extend out more; so we kicked the angle of the forehead out a bit to make Tim look more cherubic.” Also accenting the cherubic look were a round nose tip and fake ear lobes.

While Woodruff and Gillis oversaw the design and production end of the operation, makeup artist Barry Koper, assisted by Charles Porlier, handled the on-set applications. “Tom and I would come to the set occasionally when a new stage was about to be tried,” Gillis remarked, “but Barry handled most of it, and he did a phenomenal job.” Koper developed a minimalist approach to the process. “The usual method is to glue the appliances down and paint them with rubber mask grease, covering and recoloring any exposed skin so that it all looks homogeneous. But Barry would pre-



Final-stage makeup. / Tim Allen is suited up for his Santa Claus role by Tom Woodruff and members of the A.I crew.

paint pieces and then apply them, carrying the color up just a quarter or half an inch above the appliance and then blending it seamlessly so that exposed skin required virtually no makeup. The result was a look so natural that it was difficult to detect the edges, even in bright sunlight – despite some pieces that were three-quarters of an inch thick.”

For Woodruff and Gillis, the most appealing aspect of *the Santa Clause* project was its sweetness. “It was a pleasant change from slobbering, murdering monsters,” observed Gillis. “This is the first film we’ve worked on that we were actually able to take our young children to see.” Also gratifying was the chance to work with a big-name actor whose character literally carried the show. “We were really thrilled with the way Tim Allen brought our handiwork to life,” stated Woodruff. “Not only was he hilarious in the role, he was great about wearing the makeups, which sometimes took four or five hours to apply.”

The payoff for both actor and artists was the enthusiastic response that greeted the picture’s release. “One of the first reactions we heard about was at a press screening,” Woodruff remarked. “A woman turned to her friend and said, ‘Did you know that when actors have to put on that much weight for a movie, they do it by eating lots of potatoes because those are easy pounds to lose?’ That convinced us that we had really pulled it off.”

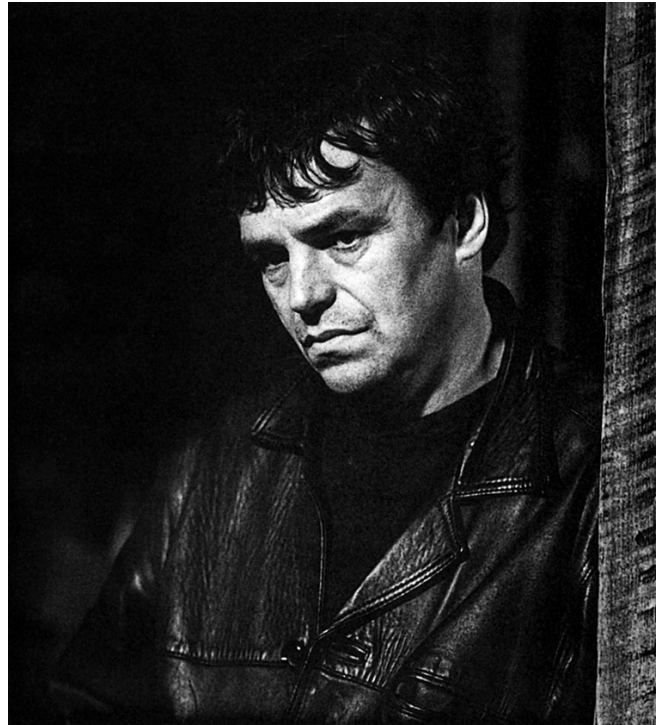
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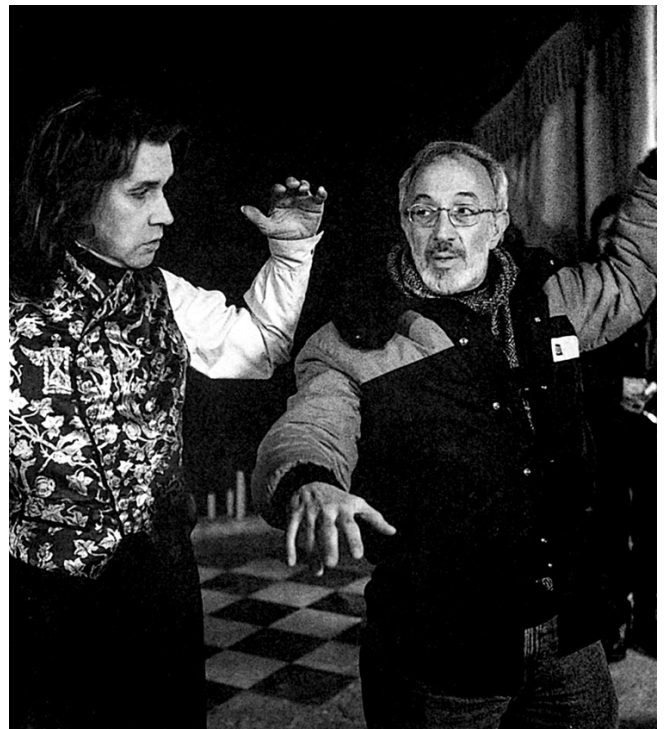
article by
Estelle Shay



*Although a film adaptation of Anne Rice's horror fantasy *Interview With the Vampire* was inevitable, nearly two decades would pass before the project – languishing in development – would make its way to the screen. The cinematic adaptation cast Tom Cruise in the pivotal role of Lestat, the diabolical vampire in search of a companion, and Brad Pitt as Louis, the young 18th-century plantation owner lured into his preternatural world.*



Director Neil Jordan – known for character-driven works – explored the film's dark themes with stylish elan.



Vampire makeup and effects were provided by Stan Winston Studio. Choreographing a fight scene, Winston demonstrates for actor Stephen Rea the movements needed from him to coordinate with an animatronic puppet built for the scene.

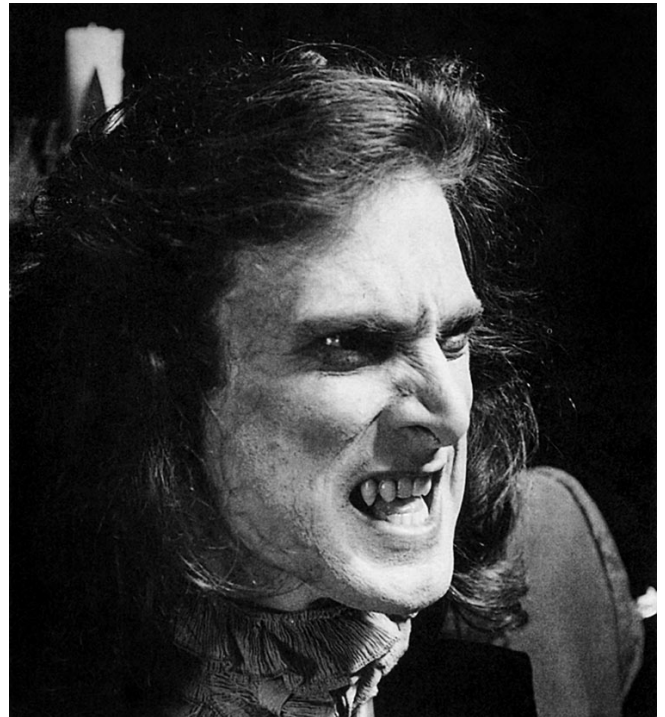
It has been nearly twenty years since *Interview With the Vampire* first enchanted readers with its oddly seductive vision of a race of immortal predators living undetected among its human prey. Published in 1976, the eerie tale by Anne Rice – told from the unique perspective of a vampire – would become a runaway bestseller and cult classic. Three later novels – *The Vampire Lestat*, *Queen of the Damned* and *Tale of the Body Thief* – would expand the vampire chronicles, ultimately securing the novelist a reputation for compelling fiction every bit as enduring as the lives of her mythic characters.

From the start, Hollywood was intrigued with the idea of translating Rice's works onto the big screen. Paramount Pictures purchased the movie rights to *Interview* shortly after it was published; however, periodic attempts to develop it proved unsuccessful and the project remained in limbo for nearly a decade. In 1985, the studio's option expired and the rights reverted to Rice, who subsequently sold them to Lorimar Pictures. Once again the project languished in development. Then in 1993, when Warner Brothers acquired Lorimar, a deal was struck with producer David Geffen of Geffen Pictures to launch the film at last.

Structured as a modern-day interview between a vampire and a journalist, the novel follows two hundred years in the life of its tortured, guilt-ridden narrator, Louis de Pointe du Lac, who as a young 18th-century New Orleans plantation owner, becomes a vampire at the hands of the charismatic but utterly depraved Lestat. Recruited to helm the movie adaptation was director Neil Jordan, whose film, *The Crying Game*, had become the sleeper hit of 1992, earning the filmmaker numerous accolades, including an Oscar for best original screenplay. Less popular was the decision to cast superstar Tom Cruise in the key role of Lestat. Eliciting an angry backlash from Rice and her legion of fans who felt the role had been dreadfully miscast, the decision resulted in a media frenzy that threatened to undermine the film before it had even begun.



Conceptual illustrator Miles Teves sketches several early renderings of Lestat.



Prior to filming, Winston team members conducted extensive tests to determine a look appropriate for the vampires. Project coordinator John Rosengrant models makeup for a key aesthetic in the design concept – translucent skin characterized by a fine network of blue veins.

With so much controversy surrounding the project, Jordan was anxious to prove the skeptics wrong. Enlisted early on to tackle the vampire makeup and effects integral to the screen interpretation was effects veteran Stan Winston, whose company had just completed groundbreaking animatronics for the most successful motion picture ever made, *Jurassic Park*. Assigned to coordinate the work at Stan Winston Studio were John Rosengrant and Shane Mahan. “John and I approached Stan about doing *Interview* after we read that it was being considered for a film,” Mahan recalled. “We were both huge fans of the Anne Rice books, and jumped at the prospect of doing a gothic horror film with period costumes – sort of a *Barry Lyndon* with vampires – a real departure from our usual fare of dinosaurs, aliens and terminators.”

Winston read the novel and was immediately taken with the intriguing characters and the artistic challenges inherent in bringing them to life. “It was unlike anything we had done before, and that made it particularly appealing,” Winston noted. “We had just come off of *Jurassic Park*, and everyone was asking us what we were planning for an encore – the expectation being that our next project would feature even bigger robotics. So I had some real concerns about our work being typecast. This was an opportunity to break out of that mold.”



The film opens in the present as Louis chronicles his two-hundred-year saga through a series of flashbacks. The vampire's otherworldly appearance was heightened by special contact lenses that intensified eye color and suggested a predatory nature.



Vampire fangs that exaggerated not just the canines, but also the teeth on either side of them, were sculpted in clay over castings of the actors' teeth, then molded paper-thin so as not to interfere with speech.



Louis sets fire to his own plantation in an effort to abandon his mortal past Digital Domain produced exterior shots of the burning mansion by compositing flame elements onto live-action plate photography of a real mansion.

Winston promptly contacted producer Stephen Woolley and requested a meeting with Jordan to present some of his ideas for the vampire makeup and effects. Concurrently, Rosengrant and Mahan began working with illustrators Mark 'Crash' McCreery and Miles Teves on several preliminary renderings of Lestat using photographs of some of the actors then under consideration for the role. "Neil was in L.A. for the Oscar ceremonies at the time," noted Winston, "so we got him to look at the initial drawings we had done." With negotiations underway and evolving conceptual designs in hand, Winston then traveled to Dublin for a lengthy strategy session with the director. "I took a storyboard artist with me; and Neil and I basically spent a week discussing ideas, conceiving and choreographing key effects, and literally rolling around on his living room floor acting out death scenes." What came out of the discussions was a guiding philosophy for the effects that would underscore the need for realism and, above all, subtlety. "Neil was in complete agreement with me that this movie should not be an effects extravaganza that would draw attention to itself and away from the characters. This was not a film about effects – it was a character study, and the characters just happened to be vampires. We were just an added brush stroke to help tell the story – something to be felt, but not seen."

While Winston and Jordan brainstormed, the crew at Stan Winston Studio continued its preliminary testing of vampire makeups. A key aesthetic in the designs would be the concept of translucent skin – like a newborn's – with veins showing through just beneath the surface. "That image was with me from the beginning," stated Winston. "I would look at the underside of my wrist, where the skin never gets any sun and you can see the veins bulging, and say: 'This is what it should look like. This is their life force – what they live and die for.'"

"We did probably the most thorough testing of makeups we've ever done," stated Mahan. "In some of our early attempts, we mixed minute amounts of metallic powder into the base to try to achieve the porcelain skin look that Anne Rice alludes to in the novel – but that didn't even read on film.



To obtain flame footage appropriate to the setting, Stetson Visual Services constructed a quarter-scale firebox – a black, essentially nondetailed, miniature of the actual mansion – which was ignited and filmed. Mark Stetson discusses the upcoming burn with visual effects supervisor Rob Legato.



For plate photography, filmmakers used a historic Louisiana plantation mansion, adding harmless smoke and lighting effects during the shoot.

Then we tested a really white makeup, similar to what was used in *Dracula*, but that just came across as too stylized and garish for our purposes.” Also considered was an idea for three-dimensional vein effects. “We came up with some foam rubber vein prosthetics to apply on the surface of the skin – but that never panned out. Not only did it look too unnatural, it was also terribly labor-intensive; and in this movie – with vampires featured in nearly every shot – that was a serious drawback.” Finally, the artists settled on a simpler strategy of applying a fine network of blue lines directly onto the skin, using the actors’ real vein patterns as a guideline. “It was a more subtle effect; and since all of the characters being cast were either very handsome or very beautiful, it gave the initial impression that these vampires were just very pale, attractive people. But get a little closer and you’d have the disturbing sensation that there was something not quite right about them.”



In a failed attempt to murder the one responsible for turning her into a child vampire, Claudia poisons Lestat then slits his throat – reducing him within seconds to a shriveled husk. The transformation – conceived as a single uninterrupted shot – was accomplished using an animatronic construct choreographed to perform in place of Tom Cruise. Engineered by the Winston team, the hydraulic puppet featured an airbag torso capable of deflating to near-skeletal form. Four variations of the head were constructed in successive stages of degeneration. Each was attached to the body and filmed in separate motion control passes that could then be seamed together digitally to achieve a fluid transformation effect. Key artist Bill Basso paints one of the heads.



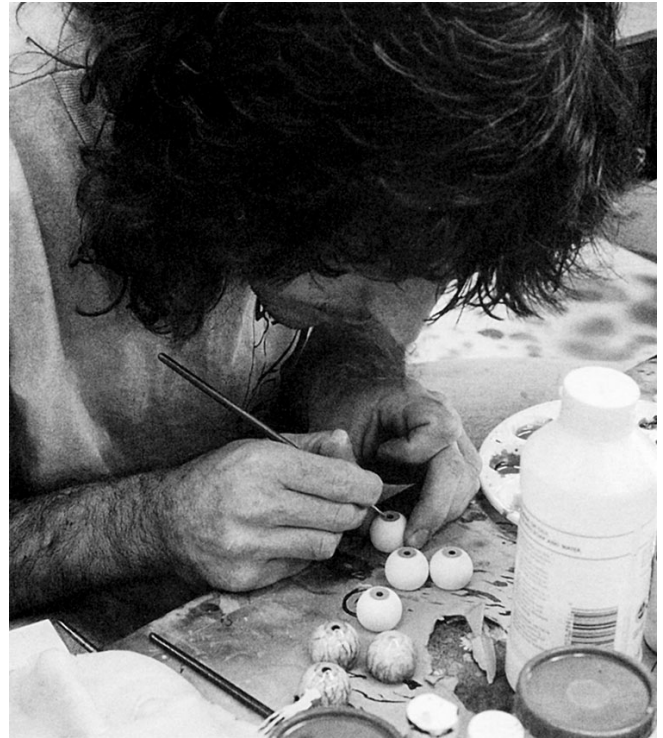
Four sets of interchangeable hands were likewise sculpted, progressing from normal to skeletal.

Adding a subtle menace to the effect were individually cast vampire teeth. “We really wanted to come up with something fresh and different,” Rosengrant recalled, “so Shane and I experimented with some clay sketches using castings of our own teeth. Those sketches led to a three-tooth design that included elongating not just the two canines, but also the teeth directly adjacent to them on either side. All together, there were six teeth that were changed. Then Neil suggested that we exaggerate the look even further, making the teeth more needle-like, with a hook or a point at the ends.”

To ensure a good fit and consistency of look and color, the makeup team turned to Gary Archer at GA Enterprises to produce the teeth. Each set was cast as a single-piece veneer extending across all eight of the upper front teeth and fitting tightly against the gum line. Using a light-cure acrylic – a special version of a material employed in the dental profession to manufacture false teeth – the hollow teeth were molded paper-thin so as not to interfere with the actors’ speech. Because of their extreme fragility, several sets were needed to outfit each vampire, with lead characters requiring as many as twelve or fourteen. Teeth for the lead actors were also provided in two different lengths. “For most scenes,” said Rosengrant, “a short version was used because it was easier to work with and also more subtle looking. We thought it would add an eeriness to the overall effect if the actors wore them continuously, so that you periodically caught little glimpses of them. Then we would switch to the longer versions for the really intense scenes, where a more aggressive look was called for. We never actually showed the fangs growing because that effect has been done a million times; and since the appliances were worn continuously, there was really no need. We would just go for the cheat and switch when necessary.”

A variety of contact lenses manufactured by Bodytech further enhanced the otherworldly appearance of the vampires. “We tried to avoid a monster-like aspect in designing the lenses,” Rosengrant noted. “Mostly we used them for the principal characters to intensify eye colors. For Lestat, we really wanted to go by the book; so we went with blue-gray lenses because that’s how the character is described.” Several other vampires wore unusually colored lenses – golden for the charismatic Armand and near-black for the villainous Santiago. Specialized lenses were created for intense scenes – particularly those featuring the vampires in fits of rage or on the attack. “We called those ‘animal eyes’ because they had larger irises with less white showing, resulting in a feral, predatory look. We also created several lenses to give the illusion of bloodshot eyes, and used them on Louis when he is starving in New Orleans and for Lestat in his various stages of degeneration.”

Supervising on-set makeup applications was Michele Burke, an Oscar winner for her work on *Quest for Fire* and Bram Stoker’s *Dracula*. For the vampire, Burke used blue tattoo coloring to simulate veins



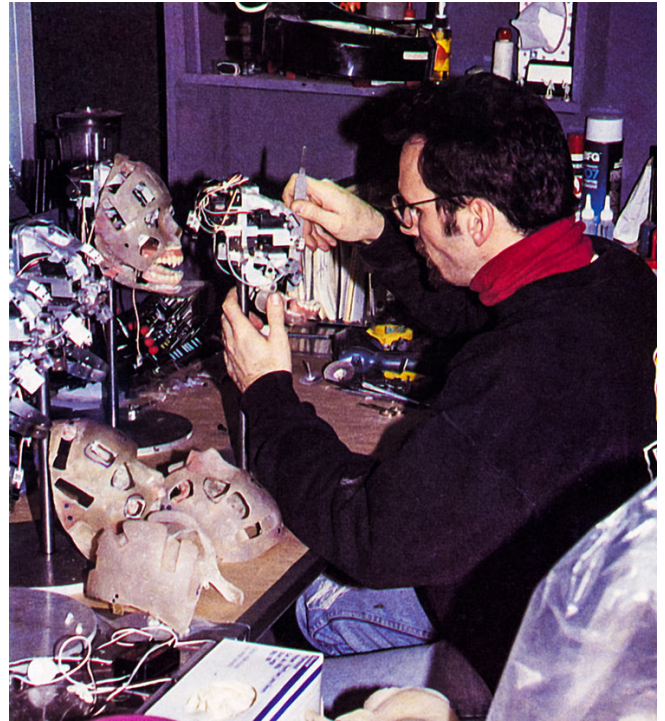
Key artist Mark Jurinko paints eyeballs for the Lestat puppets.

showing through translucent skin. “Stan had the idea of placing the actors upside down on a slant board so that their natural vein network would pop up and we could follow it,” Burke observed. “That way, if their veins happened to bulge during the course of a scene, the fake veins would be enhanced, but still natural looking, as opposed to running across the skin in all the wrong places. We applied the veins first – to the face, neck and back of the hands – adding highlights and shadows for depth. Then we covered them with a wash of ordinary pancake to soften the look and make the skin appear translucent with the veins just below the surface.”

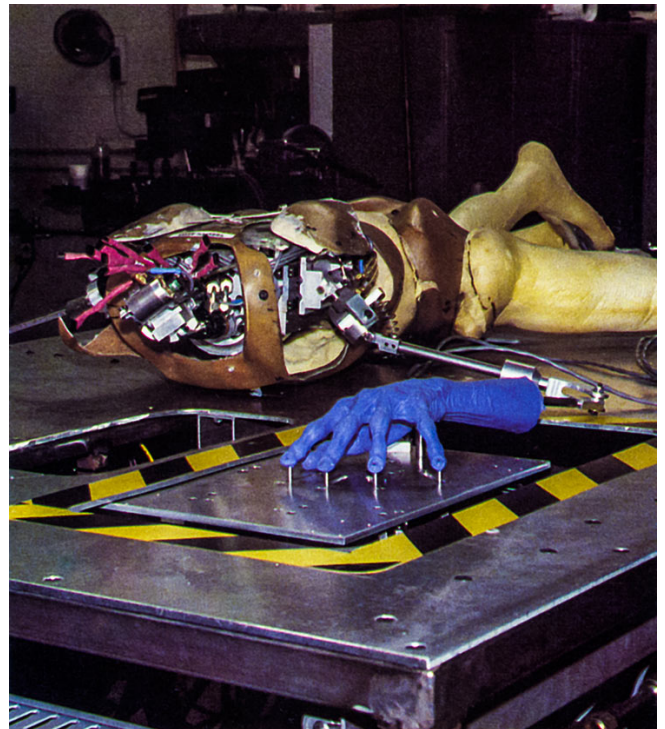
While the general look of the vein makeups was consistent from vampire to vampire, slight variations were dictated by specific character considerations or skin characteristics. “We used a dramatic, heavier vein effect on the Parisian vampires,” Burke stated, “because everything they did was more theatrical. For the child vampire Claudia, whose vein structure was naturally less prominent than the male characters, we went with a more subtle look.” All of the vampires wore long, acrylic fingernails, and many wore wigs created by Renata Leuschner based on a look established by the Winston team and Burke. Leuschner also created an elaborate selection of wigs for Tom Cruise, transforming the brown-haired actor into the golden-tressed Lestat.

Early in development, as Jordan and Winston collaborated on plans for the film’s effects, it became apparent that many of the shots would benefit from digital manipulation. Certain key sequences – such as one in which Claudia attempts to murder Lestat – had been conceived as a seamless blending of both digital effects and animatronic puppetry. Jordan would eventually turn to Digital Domain – founded by Stan Winston in partnership with James Cameron and Scott Ross – which was then gearing up for its debut on the Cameron comedy-adventure *True Lies* and was anxious to prove its mettle with a second film of equal distinction. “It was the ideal opportunity – a prestigious undertaking by a respected director,” remarked visual effects supervisor Rob Legato, “and with less than fifty shots requiring digital manipulation, it was seemingly smaller and more manageable than *True Lies*.”

Legato met with Jordan to discuss some of the anticipated visual effects, then shot some test video for the director. “It was clear that Neil didn’t want effects that were too obvious,” Legato commented, “so we tried for a more understated approach. Our tests included several sequences that demonstrated the vampire’s supernatural abilities. One was a fight scene in which a vampire exits the frame and reenters so rapidly that the movement is almost invisible. I wanted to do it without the cartoonish look you would get if we just speeded up the camera; so I skip-framed the shot and created a computer generated blur, then faded it out at a particular rate.” Another test was for a sequence – ultimately cut from the movie – in which the still-human Louis tries to shoot Lestat. When the vampire places his hand over the barrel of the gun to demonstrate his recuperative powers, the back of his hand is blown away. “My thought was to shoot it clean – quick and easy. So we filmed an actor jerking his hand away as if he had been shot. Then we filmed the wound appliance separately against a bluescreen, tracking it to the live-action footage so that it blended perfectly into the skin on his hand, existing at the plane of the skin rather than raised off of it. It was very subtle and there was nothing to give away the effect prior to its happening.”



Robotic designer Alan Scott adjusts mechanics inside one of the heads used in the transformation scene.



A complex hydraulic rig was designed to effect the animatronic performance, with actuating mechanisms concealed beneath the platform on which the figure was mounted.



The scene required fourteen separate motion control passes which were programmed and shot on stage at Digital Domain. In addition to the four phases of head and hand degeneration, additional passes were required to capture nonrepeatable aspects of the performance, such as clothing and hair movement. A blue head and hands were used to isolate those elements.

With Jordan's sanction, Digital Domain joined the production team in the summer of 1993, just as casting decisions were being finalized in preparation for the start of principal photography in the fall. Legato – in charge of background plate photography for the visual effects sequences – would follow the production company first to New Orleans and San Francisco for location shooting, then eventually to Pinewood Studios in London where the film would be completed. Legato soon realized that the undertaking was far more ambitious than he had supposed. "Although we ended up with only about forty shots in the film, they were more difficult in some ways than the work we were doing on *True Lies*, because they were forty absolutely separate shots, each requiring a different approach. So there was none of the rhythm you get when you develop a methodology and can apply it to several sequences at once." Jordan's insistence on subtlety also proved challenging. "We were going for the kind of effects that leave you wondering how they were done – or whether anything was done at all, which is often harder to accomplish. We found that most of the shots required a lot of delicate hand-tweaking."

The film opens in a hotel room in contemporary San Francisco, where Louis (Brad Pitt), unmasking his identity to journalist Malloy (Christian Slater), has consented to an interview. As the vampire recounts the events leading up to his initiation into the world of the undead, the film flashes back to 18th-century New Orleans. There, the young plantation owner, distraught over the death of his wife, first encounters the diabolical Lestat while stumbling down to the waterfront in a drunken stupor.

A dramatic night shot of the New Orleans waterfront was accomplished with a digital matte painting and model ships composited onto a live-action crane shot of the moonlit harbor. "When we did the crane shot on location," observed Legato, "we had intended to enhance it digitally with reflections on the water and such; but when nothing showed up on the film because it was too dark, we ended up recreating the water in CG. Foreground ships in the harbor were added using two- to three-foot model ships shot on a stage. Our digital matte artist, Craig Mullins did a great job of matching background ships to our models and then matching the perspective going off in the distance with haze in front of it." The inclusion of a moon in the shot further complicated the effort. "For aesthetic purposes I wanted the moon in a particular location – the only place it could logically have been – but it was a real cheat because the live-action plate was actually lit from a different



In the completed shot, the camera sweeps in as the stricken, but still normal-looking Lestat collapses in a pool of blood and shrivels to an ashen, cadaverous state.

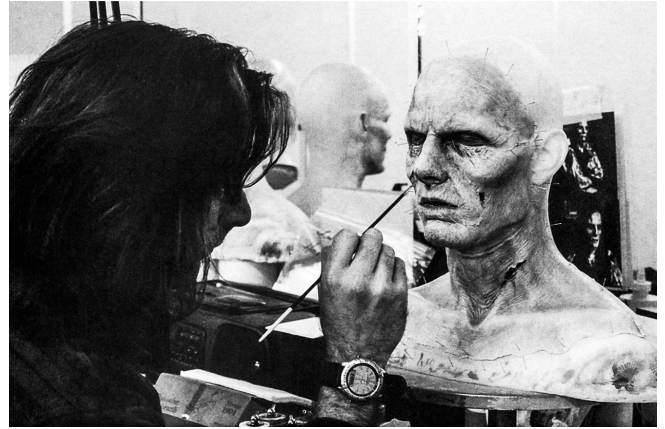


In the completed shot, the camera sweeps in as the stricken, but still normal-looking Lestat collapses in a pool of blood and shrivels to an ashen, cadaverous state.

direction. We did it anyway, adding reflections of the moon in the water and making it as subtle as possible so that the discrepancy doesn't leap out at you and your eye accepts it as real."

Taking advantage of Louis' distraught state of mind, Lestat proffers his dark gift. The subsequent metamorphosis of Louis into a vampire is the first of several digitally engineered transformations. "As Lestat drinks his blood, taking Louis to the brink of death," said Legato, "what we initially see is a corresponding drain of color from his skin. To accomplish the color drain, we pulled a roto matte of Brad Pitt's face and hands – since both were in the shot. Then digital artist Adam Stark color-corrected them, desaturating the skin tones and animating through the lights and darks of his face to give it a more interesting look. He mapped that image in, doing a kind of a wipe to reveal it, so that it had a degree of modulation and was not just a straight cross-dissolve."

Persuaded to drink from Lestat's opened vein, Louis' mortal body expires and a further transformation occurs. "Initially we had planned to have it manifested over a three-second interval," Legato elaborated, "but that just looked too 'effecty.' So we stretched it out in order to make it more subtle." Legato filmed a before-and-after plate of Pitt – one with blood on his face, and another of him completely clean in his transformed state. "Using the first plate as a reference, artist Kevin Mack duplicated on computer the configuration of the blood on Brad's face. Then he painted five or six variations of that – like key frames – depicting subsequent stages of the blood becoming smaller and smaller. We extracted those off the frozen frames on which Kevin was painting and tracked them frame by frame to the filmed sequence. When we morphed them together and did a cross-dissolve, it looked like blood drying up over a very short period of time." At one point in the process, the digital team discovered that the actor had not moved an inch during the transformation – not so much as an eye blink – which gave the shot the appearance of a freeze-frame. The potential problem was remedied by adding an overriding camera move and extending the transformation effect to the point where Pitt begins to open his eyes and move his mouth. "We also changed the color of his eyes with contact lenses and did a morph between his normal teeth and his vampire teeth. We continued adding in-between



Though presumed dead – his body dumped in a Louisiana swamp by Louis and Claudia – Lestat returns to take revenge on his assailants. Disfigurement makeup – completely covering Tom Cruise's face – included appliances designed to effect a thin, gaunt appearance while still retaining an unmistakable likeness of the actor. John Rosengrant paints detail on the completed appliance.



Makeup artist Michele Burke – responsible for all the onset applications – carefully touches up the swamp makeup between takes.

iterations to make the transformation look less like a morph – ultimately stretching it to nine seconds.”

His vampiric transformation complete, Louis looks around and examines his surroundings with heightened senses. As he does so, a statue in the garden briefly appears to come to life and follow Louis with its eyes. “That was one of the first effects we tackled,” recalled Legato, “and it ended up influencing our approach to many of the ones that followed. Initially we had planned to do a much more elaborate effect to illustrate Louis’ heightened vampire senses – a sequence where he sees inside his wife’s coffin with x-ray vision – but gradually we reined ourselves in to a much simpler approach that still captured the eerie essence of what it was like to see with vampire eyes, leaving the rest to the imagination.”

To accomplish the statue effect, a prop was sculpted by technicians at Pinewood. Legato filmed the statue motion control, then replaced it with the actress upon whom it was patterned and shot a second pass. “Getting the shot to jell was painstaking,” Legato asserted. “When we scanned the images into the computer, we discovered that they didn’t line up quite the way they were supposed to, and we had to tweak it quite a bit. We hand-tracked the eyes for a seamless matchup so we could cross-dissolve from the statue’s closed eyes to the actress’ which slowly open.” Subtle mouth movement was achieved in the same fashion, with the actress’ lips colored to match the statue’s. The sequence concludes with the eyes closing – an effect that was animated in the computer.

As Louis slowly begins to perceive the abhorrent cravings of his vampire nature, he resists Lestat’s urgings to join him in his bloodthirsty debauchery. Instead he flees his plantation, setting fire to the mansion and releasing his terrified slaves. Exterior shots of the mansion in flames – which had to match the actual historic plantation filmed in Louisiana – were accomplished with a quarter-scale miniature firebox constructed by Stetson Visual Services. “When Rob first approached us about working on the movie,” commented Mark Stetson, “I suggested building a firebox instead of a complete detailed miniature. The firebox is like a miniature block diagram of the original building – with all of its architectural features intact, but none of the detail. Since it is painted black, all that’s exposed on film are the flames emanating from it – so when it’s composited with a live-action plate of the original, it matches exactly.”

Stetson crew chief John Stirber supervised construction of the sheet metal and drywall firebox. “It measured about twenty feet on a side and was actually kind of a hybrid,” noted Stetson, “because the roof was done as a regular scale miniature which sat right on top of the firebox. That way, when it burned, you could see the roof collapsing through the window openings.” Rigged by pyrotechnics expert Joseph Viskocil, the controlled conflagration employed propane tubes that wrapped around the columns to give a spiral effect to the flames. “We rigged it for two takes,” recalled Stetson, “but it just barely survived the first one because the roof didn’t pull down like it was supposed to – it just sat there and burned.” The problem – attributed to insufficient power in the electric winch used to activate the roof collapse – was resolved in a low-tech way by hooking a pickup truck to the pull mechanism to pull the roof down.

Fearing abandonment, Lestat maintains his hold on Louis by creating a child vampire from an orphaned waif (Kirsten Dunst) whom Louis discovers in the plague-ridden slums of New Orleans. The transformation of Claudia, though shot in similar fashion to that of Louis, presented a more

complex challenge for the digital team. “Because Claudia transforms from a filthy child with flat hair to a vampire with perfectly coifed curls,” Legato noted, “our goal was to take this obvious, flashy effect and back off from it a bit.” The sequence was accomplished with two plates shot motion control – one of the actress in waif makeup and the other in vampire guise. The images were then scanned into the computer and aligned precisely to achieve a seamless cross-dissolve. “Rather than doing a straight dissolve to the new makeup, we accomplished it in stages, stretched over a number of frames – very soft-edged and subtle. With so many things moving and changing at once – the teeth, the eyes, the hair – and all of it during a camera move, the result is an imperceptible transformation. Claudia seems to magically become this other person, but you can’t quite pick the frame in which it occurs. We had to do a lot of tweaking and blending – particularly around her mouth, which was open – because it was difficult for a ten-year-old to stay still for both passes. We also discovered that she had blood on her teeth in the previous shot; so we had to match that, tracking it on the clean teeth, then removing it.”

Even more arduous was the morph from straight to curly hair. “Hair is almost impossible to do with CGI and still have it look real,” Legato observed. “But a straight morph from flat hair to curly hair would have looked too much like an effect.” Tasked with a more subtle transformation, digital artists would spend months laboring to match the real hair with a computer model that could then be animated to go from straight to curly. Each three-dimensional curl, modeled digitally by artist Judith Crow, would require its own set of texture maps. “We had to match the real curls exactly,” stated Kevin Mack. “So I used an Amazon 3-D paint program to create separate maps for opacity, specularity, color and texture.” The computer generated hair was subsequently tracked to the motion control move so that it changed as the camera shifted.

As years pass by and Claudia ages in mind but not in body, her resentment grows of the vampire who robbed her of physical maturity. One night, in a rage, she slashes Lestat’s cheeks with a pair of scissors, but the wounds heal instantly. For the effect, a plate was filmed with Tom Cruise reacting as if he has been slashed. At Stan Winston Studio, a wound appliance was designed and rigged to bleed, then positioned on a blue lifecast of Cruise’s head that could be pivoted and moved to match the exact angle of the live shot so that just the image of the wound and the dripping blood could be extracted. At Digital Domain, digital artist Michael Kanfer – working with Kevin Mack and animator Dennis Blakey – created identifying marks on the footage of the actor’s face that would enable him to track the wounds perfectly. “I image-processed the shot of Tom like an infrared photograph,” said Kanfer, “accentuating veins and other marks that were just barely visible in the normal color image. By doing that, the computer could lock onto targets on both sides of the face and follow those reference points in every frame, calculating and tracking any movement. I could then take the wound and blood particles and duplicate that movement to make them look like they were on the skin.”

For the illusion of near-instant recovery, Mack extrapolated the image and painted variations of it at different stages of healing. “Then I tracked it to both sides of the face,” Kanfer added, “and Dennis Blakey did some 3-D morphing work where you see the wounds closing up.” To achieve the effect of the blood coagulating and dropping off of the vampire’s face as the wounds heal, Kanfer resorted to somewhat unorthodox means. “I tried animating the blood flakes, but I wasn’t getting anywhere. So I thought maybe I could shoot it practically and then integrate it. I happened to spot a garlic husk in my kitchen that had the same flaky qualities as dried blood. I broke it up in little pieces, shot them against black, turned them a reddish-brown color to look like blood, and did match edits.”

Scheming to free herself and Louis from Lestat’s control, Claudia pretends to reconcile with the vampire, tricking him into drinking blood from a corpse. Poisoned by the bad blood, Lestat falls to his knees as Claudia slips behind him and slashes his throat. In what appears to be a nonstop twelve-second take, the vampire collapses and shrivels into a desiccated heap as blood gushes onto the carpet from his gaping wound. Conceived and choreographed by Stan Winston, the effect was a highly technical effort that broke new ground in its state-of-the-art animatronics and seamless blending of live-action via digital techniques. “My idea was to create an effect that was so seamless it would be invisible,” asserted Winston. “This vampire would literally transform in front of your eyes, but you would not be able to see the process of its happening. That is something we had never done before.”

To achieve his vision, Winston proposed creating an animatronic character with interchangeable heads depicting different stages of the transformation. “The puppet needed to be capable of giving a real performance,” said Winston, “so before we began to build it, we had Neil direct Tom in acting out the death scene, and videotaped it for reference. We



Lestat taunts his protégé turned traitor.



Defending himself, Louis flings an oil lamp at the enraged vampire, setting him afire. Closeups of Lestat in flames were accomplished by igniting and photographing a dummy and a robotic arm to obtain separate fire elements which were then aligned to live footage of Tom Cruise.



As Louis and Claudia flee aboard a ship bound for Europe, the flames consuming Lestat ignite his surroundings, and

studied every nuance of the performance, then built a robot that could do exactly what the actor had done.” Engineered by Tim Nordella, Alan Scott and Rich Haugen, the hydraulically operated puppet was designed around a skeletal sculpture of Cruise and mounted on a table with the miniature hydraulic systems hidden underneath. “After his throat is cut, Lestat falls to the ground,” Nordella explained, “so

the fire spreads. A view of the city in flames – seen from the perspective of the vampires standing on ship deck – was digitally engineered by grabbing and repeating segments from footage of the burning waterfront set to create the illusion of a large-scale conflagration. Photographed against a bluescreen, the foreground actors were composited over the background imagery, with flickering firelight added to better integrate them into the shot.

we configured the puppet in that position, actuating it from underneath – through slots in the table – to perform a crawling motion. The torso and legs could slide forward about nine inches, and one hand zoomed forward and moved from side to side. Other hydraulics controlled head, neck, arm and finger articulation.” An inflated airbag in the shape of Cruise’s body was sewn by Karen Mason to fit around the skeleton. As the puppet moved, the body could be slowly deflated to its inner skeletal shape so that its clothes would become baggy and the vampire would appear to shrivel.

To effect facial changes during the transformation, four articulated heads were sculpted by Miles Teves to represent the stages of degeneration – each capable of eye, jaw, brow and cheek movement. “We wanted it to look like he was starving to death,” commented Winston, “not just shriveling up or disintegrating into dust – more like the look of an Auschwitz victim or someone suffering from AIDS. Since that required artistic interpretation, we did research on concentration camp victims and AIDS victims. Then we took a lifecast of Tom Cruise and slowly, step by step, in sculpture after sculpture, carved it down to its bone structure.” While the first stage was an exact replica of Cruise before Lestat begins to transform, the successive three stages represented the advancing degeneration. Four sets of hands, sculpted by Paul Mejias, were also made to match the heads, moving from normal to near-skeletal.

Filming the complicated effect required close collaboration between the Winston crew and the team at Digital Domain. “This was a nonstop transformation that was filmed in one continuous camera move,” remarked Rosengrant. “The sequence actually began with a live-action shot – filmed at Pinewood – of Tom Cruise wearing a throat-slash appliance equipped with blood tubes. After his throat is cut, he falls forward, collapsing onto his hands, and is replaced – following a brief cutaway to Claudia – by our hydraulic puppet.”

Shot motion control at Digital Domain, the puppet’s moves were programmed into a computer by Craig Barr and locked to the camera movement. “What threw a wrench into the works,” Rosengrant continued, “was that certain aspects of its performance were nonrepeatable – the way the hair moved, the way the clothing folded and shifted, or its interaction with the gushing blood – all were factors we could not control. So in addition to shooting the four different stages of head and hand replacements as separate passes, we also had to isolate numerous other elements in the performance, film them separately and make sure they lined up perfectly.”

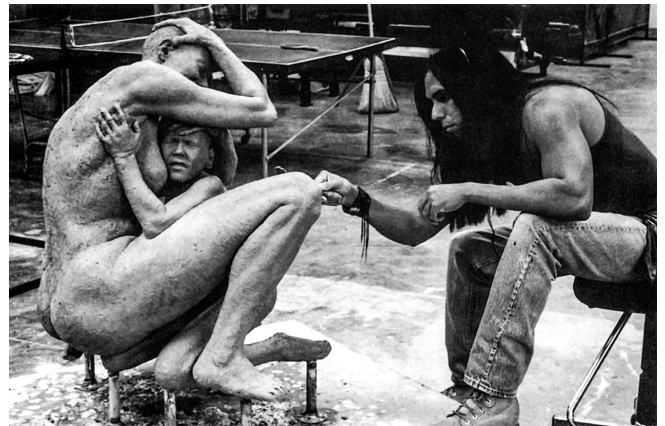
The effect would ultimately require fourteen separate passes. “We did four passes with the head and hands changing, masking the rest of the body in a bluescreen suit,” said Shane Mahan. “Then we did a hair and clothing pass, substituting a blue head and blue hands on the puppet so that just the hair and clothing could be extracted from the shot. Next we did a pass of just the blood pouring out, and so on.” For the background pass, the live-action set from Pinewood was replicated on stage

at Digital Domain. An additional pass of blood pooling on the carpet was filmed using red mylar – for its reflective quality – laid at the base of the puppet to simulate blood. The effect employed a matte pass, shot using a piece of white foam-core laid on the rug to represent the shape of the blood pool. Digital artists would later employ 3-D tracking to cause the pool of blood to extend out to the edge and give it a soft look as if it were soaking into the carpet.

Once all the elements were completed, they were turned over to Digital Domain where Dennis Blakey supervised combining them into an integrated whole. “We composited the various elements and digitally morphed between the stages,” said computer graphics supervisor Jim Hillin. “We also fine-tuned the shot, adding shadows beneath Lestat’s legs and rotoing his face for an overall color drain to reflect his loss of blood and make him look more like the bleached-out corpse that Louis and Claudia dump into a swamp.” The end result was exactly the effect Winston had envisioned. “It’s an astonishing twelve seconds of film that is so subtle you almost don’t know it’s happening,” Winston remarked. “But that’s the beauty of it.”

With Lestat dispatched to a watery grave, Louis and Claudia book passage aboard a ship bound for Europe, determined to locate others of their kind. As they prepare to depart their lodging, however, Lestat reappears – hideously disfigured, but alive and seeking revenge. Based on a concept rendering by Miles Teves, a special makeup for Lestat’s return from the swamp was sculpted and executed by John Rosengrant. “This was full demonic Lestat,” said Rosengrant, “however the challenge was not to go over the top by making him too grotesque. So even though we completely covered his face in rubber, some of the appliances were paper thin – just enough to blend from a rise on the cheekbones and eyebrows back into the hollows of his cheeks. He still looked gaunt and thin, but we didn’t have a built-up mask face that bore no resemblance to the actor.”

Under attack by Lestat, Louis flings an oil lamp at the enraged vampire, igniting him. Digital manipulation was used to add realism to the first two shots in the sequence, while the remaining shots featured a stuntman. “We wanted audiences to see Tom’s face in the flames – not just a stuntman in a mask,” explained Michael Kanfer. “So we filmed a live-action plate of Tom stumbling about and reacting as if flames were shooting up his body. Then we filmed the fire element using a dummy body. We lit each body part on fire individually – legs, chest, head and arms – and shot it against black. Using our



After years of fruitless search, Louis and Claudia at last find others of their kind performing as a theatrical company at the Theater of the Vampires in Paris. Their reception is anything but cordial, however, when the troupe learns of their attempt to murder another vampire. Imprisoned in a deep airwell, Claudia and Madeleine – a new initiate – are incinerated by sunlight streaming in at daybreak. Winston key artist Joey Orosco sculpts the two women huddled together for a sequence in which Louis discovers their charred remains.



special tracking software, we tracked these elements to the live-action plate, aligning them as closely as possible into the perspective of the shot. We had to plan a series of ignition timings for each of the elements so it would look like the fire was traveling up the body instead of just bursting into flames all at once. Since dummy joints do not articulate the way a real body would, we also used warping software so that when the track appeared to go off a bit, we could bend and pull the image, like putty, on a frame by frame basis.”

In a segment ultimately excised from the film, Lestat resurfaces amidst the mob of angry vampires in the theater catacombs, still bearing the healed scars of his fiery ordeal. Bill Basso sculpts the prosthetic burn makeup designed for the scene.

Flailing arms proved particularly troublesome. “Tom’s arms were moving much faster than any other part of his body,” continued Kanfer, “and when you move something that is on fire that quickly, the wind distorts the flames. So we built a small motion controlled robotic arm – used to represent both of Tom’s – which consisted of two joints of steel covered with fabric. We used a video switcher to help match-move the mechanical arm to Tom’s movements in the original footage. Then we lit it on fire to get our moving flame element which was composited over the live-action plate.”

As the fire spreads, Claudia and Louis escape to the ship, boarding it moments before it pulls out of the harbor. For an elaborate nighttime shot of the city in flames – filmed from the perspective of the two vampires standing on ship deck – digital manipulation once again proved invaluable. “Only a very small portion of the waterfront set was actually burned,” noted Adam Stark, “but they shot it for a very long period of time. In the computer, I was able to grab buildings from different parts of the take and move them around to get a complete burning waterfront. I also added other elements like smoke on the horizon and reflections in the water for the foreground buildings. Then we went out on a boat with an encoder to record the rocking motion, and I brought that data into our system. By applying it to the scene, we were able to simulate the movement of the ship at sea.” To incorporate the vampires in the shot, Pitt and Dunst were photographed against a bluescreen and composited over the background imagery. “To fully integrate them into the scene, I had to make them the right density and shade. I also had to animate flickering lights from the burning foreground on them and on the railing.”

Following an exhaustive search throughout the Mediterranean for evidence of other immortals, Louis and Claudia eventually abandon their quest and settle in Paris. There, at last, they discover their own kind – led by the ancient vampire Armand (Antonio Banderas) – performing as a theatrical company by night and living in the catacombs beneath the theater by day. Upon learning that Louis and Claudia have violated the vampire taboo against harming one of their own, the troupe turns against the newcomers. Louis and Claudia are seized – along with the newly initiated Madeleine (Domiziana Giordano) – and brought to the catacombs for punishment. In a sequence shot, but ultimately cut from the final version of the film, Lestat makes a surprise reappearance amidst the mob of angry vampires. An elaborate prosthetic burn makeup, sculpted by Bill Basso, was created for the excised scene. “Forty years have passed since we left Lestat – presumed dead – in Hew Orleans,” Rosengrant observed, “so this was a healed burn look. We studied medical books on burns and burn victims, and again tried to design prosthetics that were very thin to avoid that ‘built-up’ look. We also pre-painted all of the pieces so there would be minimal coloration work required during application.”

Sealed inside a coffin behind a bricked-up wall, Louis is rendered helpless while the vampires inflict deadly retribution on the terrified women, shoving them into an inescapable airwell, open at the top to the night sky. Shots of the moon – and later the sun – traversing the airwell opening were obtained with an eighteen-foot-tall model built by Stetson Visual Services and used as an extension of a shaft set filmed at Pinewood. “Tully Summers sculpted the airwell in a urethane foam called ‘green death,’” said Mark Stetson. “It was laid on its side and it went very quickly in that medium. We framed it in one-by-fours around the outside and stood it on a stand so that it would be a convenient camera height.”

Awakened at daybreak, the two women cry out in pain and terror as sunlight streaming into the shaft begins to sear their flesh. The initial sequence featured two effects shots – a pull-back on the vampires as steam rises from their skin and lesions begin to appear, and a subsequent closeup of the burns intensifying and spreading. Lesion elements were rendered digitally by Kevin Mack and incorporated into the shots by Adam Stark. “Kevin would take a frame of the background plate and paint burnt arm, hand and face wound elements over it,” said Stark. “Then I would decide what areas of those elements I wanted to use and how I wanted to print them against the skin to blend in with the skin texture. I applied scaling, rotation and tracking data derived from the background subject to Kevin’s wound elements to make them move effectively with the shot. I also did a series of 2-D morphs to create the illusion that they are appearing at different times and spreading across the skin.”

Adding to the realism were steam elements. Body sculptures of the two women were painted black and heated under lamps for half an hour, then sprayed with water and photographed heavily backlit to record the steam rising off them. “I sized and shaped those elements,” Stark continued, “applying the tracking and scaling data. Then Rob Legato and I decided where, when and at what density we wanted the steam to appear, aiming for as photorealistic an effect as possible.”

Rescued by Armand the following evening, Louis rushes to the airwell where all that remains of Claudia and Madeleine are their ashes, still in the shape of the two forlorn figures huddled in each other’s arms. Approaching their charred forms, Louis gently touches one of them, setting off a chain reaction which causes both to disintegrate into dust. “That sequence took the longest of any shot because it required so much R&D to pull it off,” Legato recalled. “We wanted it to look real, not like some supernatural occurrence – as if the two were actually burned to a crisp, with all the moisture taken out of their bodies. To achieve that, we needed something that could maintain its integrity, then crumble the way we wanted. But no real substance had those properties. We tried dry sand and wet sand – but when we removed the molds, neither would hold together. Then we tried frozen sand – but you had to find the magic twenty seconds when it thawed and crumbled, and that was impossible to predict.” The solution again entailed a marriage of practical and digital effects. “We started with a live element of a real sculpture, then added CG elements to suggest the fragility and the start of the crumbling. When it reaches the point where its integrity fails completely, we again shot it live.”

Sculpted in water clay by Joey Orosco, then molded and cast in rigid foam at Stan Winston Studio, the ash figures were created initially as a static prop for Louis’ discovery of the remains. Shipped back to the States from Pinewood, it was then filmed at Digital Domain for the crumbling effect. “We

cut the sculpture in sections like a big jigsaw puzzle,” stated Legato, “and reconstructed it over a skeleton frame, filling the whole thing up with ashes. The pieces were all prescored so that we could break them off easily. Then Craig Caton built a mechanical rig to pull the thing apart piece by piece. We attached trip wires to the pieces and hooked the wires up to a motor that ran off our motion control system, enabling us to control the sequence of events so that we could time each move precisely. We determined in what order we wanted the sculpture to collapse by relying on simple laws of gravity. If one of the arms dropped first and that arm supported the head, then the head would roll next – and so on. It took about ten takes to get the timing just right.”



A paint study of the unseen Lestat burn makeup.



Huddled with Madeleine in the airwell, Claudia (Kirsten Dunst) cries out in pain and terror as the sunlight sears her flesh. Shots of lesions spreading across her skin were accomplished by tracking digitally painted burn elements onto the live-action plate. Steam was photographed and added to enhance the realism.



Subsequent shots of the remains of Claudia and Madeleine crumbling into dust were accomplished through a combination of practical effects and computer enhancement.

Upon completing the practical effect, Digital Domain added some two dozen computer elements to enhance the sequence. Chief among them were computer generated dust particles created by Peter Farson and intermixed with practically shot dust and ash elements falling from cracks forming in the dummy. Since the particles were rendered in 2-D, Kevin Mack painted secondary layers behind them, revealing bone and other matter on the model. All of the digital elements were then assembled and composited into the shot by Adam Stark. "We used a Prisms particle system to achieve the dust effect," elaborated Legato. "It was a very involved process that took weeks and weeks to perfect."

With Claudia gone, Louis returns to the Theater of the Vampires, determined to exact his revenge. Emptying barrels of kerosene into the catacombs, he ignites the coffins where the vampires lie sleeping. As the catacombs burn, vampires leap out of their coffins in flames, climbing walls and ceilings in an effort to escape. For a shot of a vampire ablaze hanging above the floor, a stuntman was filmed hanging fifteen to twenty feet off the ground on a rig built by Stetson Visual Services. "We costumed him up, covered him with glue, lit him on fire and filmed him against a bluescreen," Mack explained. Since protective clothing for the stuntman included a noticeable head covering, digital artists replaced the head with a 3-D computer image. "We had done some early tests with an Amazon 3-D paint program, using it to create a texture map from pictures of a head shot at different angles. So when it came time to do the shot, we went out to Cyberscan and scanned our stuntman's head to create the digitized head geometry. From there I painted three stages of maps depicting the flesh blistering and burning, then splitting open to reveal muscle and tissue beneath and finally just a skull. The maps looked like a skinned animal with the skin laid out flat – and with the cyber-data, they wrapped right around the head geometry so that when the animators moved the head or opened the mouth to make it scream, they fit right on."

Before Louis can retreat from the burning theater, he is confronted by the malevolent Santiago (Stephen Rea) who flashes out of frame as Louis swings a scythe at him, then reappears faster than the eye can see. The effect was a combination split-screen and digital composite. "It starts with a split-screen," noted Stark, "combining separate live-action plates of Louis and Santiago. The split-



A vampire is engulfed in flames as Louis sets fire to the catacombs in an act of revenge. Although a live burn employing a stunt performer was photographed against a bluescreen, digital artists replaced the stuntman's head with computer imagery exposing three stages of burning flesh.



In the aftermath of the blaze, the smoldering theater is revealed in a continuous shot that pulls up dramatically from the catacombs to the roof. Filmed motion control using a detailed miniature built by Stetson Visual Services, the scene was embellished with elements of smoke, glowing embers, soot and dust supplied by the Digital Domain team.

screen – necessitated by the danger of the swinging scythe – required seaming all the smoke and fire from the two plates perfectly. As Santiago moves around to the front and Louis swings the scythe, the split-screen migrates on an angle to where it is no longer a split-screen, but completely the plate of Louis. Then I extracted Santiago from his plate and composited him onto the plate with Louis.”

To create the illusion of speed in the villain’s movements, Stark transformed the image of Santiago leaving the scene into transparent, soft blur elements by adjusting printing density. “The density at which the image is printed determines how fast the subject appears to be moving,” Stark explained, “so I faded him down to almost nothing – where you could see through most of him – then transitioned the image to very thin, wispy blur elements. As Santiago reenters the shot, I had to do the same thing, matching up and removing frames and printing at different levels to increase the blur. Then, as he reaches out and touches Louis’ shoulder, I made the blur elements transition into the solid image for the final frame.”

As Louis’ scythe connects, Santiago is decapitated, his headless torso dropping to its knees and collapsing in one continuous motion. The startling effect was filmed with an animatronic puppet constructed by the Winston team. “We retained a really good likeness of Stephen by using a silicone skin for our puppet rather than foam rubber,” stated John

Rosengrant. “Silicone moves more like real skin, and there is no shrinkage or distortion – we actually developed a sort of hybrid mix in the studio and used it on all of our puppets. Although the puppet was painted in the shop, when we got to the set Shane added Stephen’s makeup over it to get an even closer likeness.”

To accomplish the elaborate sequence of moves occurring at the moment of decapitation, the puppet featured articulation devices and a triggering mechanism devised by Richard Landon and Al Sousa. “We had tubes running up to a disguised slit rigged to open up and spray and pump blood the moment we triggered the decapitation,” Rosengrant explained. “The arms were puppeteered by rod and the head was radio-controlled. There were also little cylinders inside the puppet that we could trigger after the head was chopped off to make the knees buckle, causing the puppet body to sink down and pitch forward.” A coda to



As the film draws to its conclusion, Louis returns to New Orleans where he finds Lestat – dispirited and starving – living in self-imposed isolation in a rundown mansion.



Makeup coordinator Shane Mahan sculpts the final makeup appliance used for Lestat – a scaled-back version of his original design which sits nearby. The initial prosthetic – a more radical concept with shrunken cheeks and remnants of burn scars – was rejected when Tom Cruise expressed strong reservations about playing the scene constricted by heavy makeup.

the sequence – cut from the movie because it was considered too graphic – made use of an age-old effects device. “We put Stephen Rea through the floor with just his head and one shoulder exposed and a rather gory appliance coming off the neck and upper chest,” said Rosengrant. “The severed head looked up at Louis, sort of smiled and said, ‘Touché!’”

As dawn breaks and the smoke clears, the fire-gutted theater is revealed in a dramatic shot that pulls up from the catacombs all the way to the roof, tilting finally to a view of the Paris skyline. A sixth-scale miniature theater was constructed by Stetson Visual Services to achieve the effect. “We worked with Rob Legato on a number of mockups,” recalled Mark Stetson, “before arriving at a horizontal configuration that enabled him to accomplish the motion control shot in one continuous move. After that, it was pretty much straightforward sculpture and fabrication, except that all of the details – including some miniature burnt corpses of vampires contributed by Stan Winston and his crew – had to be painstakingly glued into place on the sides.” The sideways configuration also made for a particularly challenging job of rigging. “We had to use reinforcing elements to support the structure—and suspend them in such a way that parts of them could be removed to allow the camera rig to travel through.”

Nearly fifteen elements – both digital and practical – were added to provide atmosphere. “It was an interesting exercise,” Adam Stark commented, “because the shot entailed a complex corkscrew camera move – but all of the additional elements were locked off, so I had to extract camera information from the scene and apply it to each element. I introduced practically-shot smoke steaming up from the burnt bodies and blowing in from the doorway. Then, as the camera pulls out, I added wind rushing in and dust blowing. To simulate glowing embers, Rob Legato put flour on plexiglass and shot it with a red gel. I took some of those elements and modulated them to look like coals were actually fanning up and down with the breeze.”

The camera continues to pull up, revealing rays of sunlight streaming into the theater. Moving past a stained glass window – onto which Stark digitally composited soot – the camera reaches the burnt-out roof. “The light coming through the roof in the plate completely obliterated the frame,” observed Stark. “To get the look we wanted, I brought it down and seamed that into the background plate.” For a view of the city seen through the roof, a bluescreen pass of the opening was shot and a digital painting of period Paris – done by matte artist Craig Mullins – was inserted and tracked to the camera move. “I was able to give the impression of depth to the static painting by printing back some of the light that had been extracted – varying the amount, with less over the foreground buildings and more on those in the background. Finally, I restored the lens flare from the original background piece.”

Having rejected Armand’s offer of eternal companionship, Louis returns to America, remaining there through the turn of the century and into the present. Concluding his narrative, he recounts one last encounter with Lestat, whom he discovers in a ruined mansion in New Orleans, living in self-imposed isolation. A final prosthetic makeup, designed by Shane Mahan, was used to portray the ancient vampire as a frightened, broken character, completely out of sync with the times. “The initial version of the makeup was much more radical than what we ended up using,” observed Mahan. “It was a full face appliance with remnants of the burn scars, and had an extreme shrunken aspect so that he really looked like he was starving. But Tom expressed strong reservations about playing the scene with that much makeup on; so I scaled it back to just a forehead and two

cheekbone appliances to give the impression of his skull showing through, with the mouth and the rest of his face exposed. It was far more subtle, but still effective.”

Louis leaves Lestat to his isolation as the flashback concludes, bringing the two-hundred-year saga to a close. But a surprise awaits Malloy as he retreats to the safety of his car. There the indomitable Lestat makes one final unexpected appearance – popping up in the back seat to ambush the interviewer, at long last ending his prolonged starvation. With new blood coursing through his system, the vampire quickly reverts to his former robust self. “Rather than trying to paint the life back into him,” noted Kevin Mack, “we shot the footage with Lestat looking rejuvenated and went in the opposite direction. I just grabbed a frame from some earlier reference footage where he is sick and haggard looking, and painted him back to that state, adding things like chapped lips, hollow cheeks and wrinkles around the eyes.” These elements were then incorporated into the footage by Adam Stark. “I composited them into place,” Stark explained, “creating mattes where necessary, tracking, adding motion blur and color-correcting. Then I created 2-D morphs of each of the elements to dissolve off at different times, revealing the rejuvenated background plate that was originally shot. Finally, I blended the whole transformation to coincide with Lestat’s head movement in order to lend a more organic feel to the effect.”

In November 1994, *Interview With the Vampire* opened in theaters around the country. It had been a long journey from the written page – but for many, including Anne Rice, the film did not disappoint. Shortly before its release, the author took out a full-page ad in *Daily Variety* retracting her earlier criticisms and proclaiming her delight in every aspect of the production. As moviegoers flocked to the film, domestic boxoffice returns soared past the \$100 million mark, making it an immensely profitable venture as well as a critical success.

For Neil Jordan, *Interview With the Vampire* would represent his first mainstream film triumph. For Digital Domain, it would cement their reputation as a state-of-the-art digital production facility. For Stan Winston Studio, it was an achievement every bit as thrilling as the dinosaurs in *Jurassic Park*. “Both of these films entailed a blending of state-of-the-art effects techniques – and I am a major fan of that,” Winston remarked. “The thing that made the effects work is that we were able to take our digital and mechanical tools and bring them together seamlessly to fool the audience into not seeing any technique at all.” The movie was also a flagship one for Winston in a more personal way. “Although it was not my vision to help found an enormous digital facility, I have always wanted to maintain authorship of the effects I conceived – to be in the loop from start to finish. Digital Domain brought me into that loop and allowed me the satisfaction of seeing the characters come together. To me, that was the ultimate thrill.”

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KIRK OUT

image

article by
Kevin H. Martin

We are not buying stories about the original *Star Trek* characters ... or their descendants;

We do not do stories about psi-forces or mysterious psychic powers;

Avoid storms in space;

Beware of spaceship battles;

No mad scientists, or stories in which technology is considered the villain.

To bring syndicated television's most successful dramatic hour to the big screen, producer Rick Berman and screenwriters Ronald D. Moore and Brannon Braga allowed themselves to cheerfully violate any number of set-in-stone dictums long in effect for prospective writers of *Star Trek: The Next Generation*. In concocting their tale of a brilliant, but obsessed madman threatening millions from a mountaintop, they plumbed the stuff from which 007 thrillers are fashioned. But the tortured genius of *Star Trek*

Generations is not driven by megalomania, and the one man who stands in his way bears little resemblance – except a common heritage and a similarly receding hairline – to Sean Connery.

The unparalleled success of *Star Trek* in the episodic television realm had not always translated to the big screen, as evidenced by the theatrical grosses of six previous features – only one of which, *Star Trek IV: The Voyage Home*, soared beyond 'solid hit' expectations into the undiscovered country of blockbusterdom. Many had come to view the *Star Trek* film series as a reliably sturdy body in need of new blood. By way of contrast, *The Next Generation* was overdue to expire from advanced age, although



Taking creative liberties with time continuum concepts, the makers of Star Trek Generations bridged the seventy-eight-year span between the Enterprise stewardships of Captain James T. Kirk (William Shatner) and Captain Jean-Luc Picard (Patrick Stewart). In the film – the seventh feature born of the original Star Trek television series – Kirk and Picard join forces against Dr. Tolian Soran (Malcolm McDowell), a deranged scientist who will go to any lengths to ensure his return to the Nexus, a euphoric state of altered consciousness achieved within a nebulous, galaxy-spanning energy ribbon. To bring in the film's ambitious effects on a modest budget, first-time feature director David Carson relied on visual effects supervisors Ron Moore and John Knoll who were backed by a full complement of talent from Industrial Light & Magic and Santa Barbara Studios.



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its heart beat vigorously on. In essence, *Star Trek Generations* became a transplant operation.

But this transplant would be performed as tightly-budgeted surgery. Paramount had put a restrictive ceiling on the *Generations* budget despite the fact that it was to be one of the most ambitious *Trek* films ever, bringing together a host of characters from both past and present and spanning nearly one hundred years. Expectations for the movie were stratospherically high. Paramount was looking for a major *Star Trek* hit, and fans were anxiously anticipating the high drama of a first meeting between the old *Trek* world and the new.

eight-year span between the *Enterprise* stewardships of Captain James T. Kirk (William Shatner) and Captain Jean-Luc Picard (Patrick Stewart). In the film – the seventh feature born of the original *Star Trek* television series – Kirk and Picard join forces against Dr. Tolian Soran (Malcolm McDowell), a deranged scientist who will go to any lengths to ensure his return to the Nexus, a euphoric state of altered consciousness achieved within a nebulous, galaxy-spanning energy ribbon. To bring in the film's ambitious effects on a modest budget, first-time feature director David Carson relied on visual effects supervisors Ron Moore and John Knoll who were backed by a full complement of talent from Industrial Light & Magic and Santa Barbara Studios.

Faced with meeting those expectations in an atmosphere of tight-fisted spending was director David Carson, a veteran of both *The Next Generation* and its spin-off *Deep Space Nine*. Committed to retaining crucial scenes and high production values in his feature film debut, the British-born Carson struck a deal with Paramount that saved a number of shots from the bean-counters' red pencil. "Paramount didn't want to spend a great deal of money on the film," Carson recalled. "But here they were confronted with this enormous, epic script. So what they wanted to do was cut costs by cutting scenes. I resisted that, and suggested that we cut costs instead by using my supposed speed as a television director to shorten the schedule. I wanted to keep the scale and size of the movie as it was; but to do that, I had to commit to shooting it in only fifty days, as opposed to the seventy or so days they had originally scheduled." In Carson's mind, a key to realizing the abridged schedule was the recruitment of director of photography John Alonzo. "John is not only a brilliant cinematographer, he also works at a high speed. Because of his immense knowledge and skill, he is able to find economical ways to produce incredible atmosphere. He is a very clever man, and he was instrumental in helping me to meet the schedule."

With Alonzo on the project, Carson and the producers began assembling their effects team. "Our initial instinct," said co-producer Peter Lauritson, "was to utilize all of the same people who have been doing our effects for the series for the last seven years. But the fact was we still had to continue supplying shots for two television series while shooting the feature. I knew that some of the effects would be done with computer graphics, so Industrial Light & Magic immediately came to mind. When we met with their creative team – visual effects supervisor John Knoll, co-supervisor Alex Seiden and art director Bill George – it really felt right. They had a lot of enthusiasm for the project, and that's something you can't buy." Other firms contributing to the effort included CIS-Hollywood, E-Film, The Post Group, Illusion Arts, Image G, Digital Magic and Santa Barbara Studios – all veterans seasoned by the week-in, week-out grind of the TV series.

To maintain continuity in effects that had been well established in the series, Lauritson appointed as visual effects supervisor Ron Moore, a *Next Generation* effects coordinator and supervisor who segued directly from the series into the feature. Moore saw *Star Trek Generations* as an opportunity to improve on the series status quo and to achieve greater dynamics in shooting the *Enterprise* and other spacecraft models. "We'd been pretty successful with miniatures," Moore noted, "and we

wanted to keep that look. But we also saw the chance to amplify it with CGI models. Back when we did the pilot for *The Next Generation*, we were right at the forefront of technology. But during the last couple of years on the series, I think we grew a little stale. This was the time to reestablish our position.”

In the film’s first sequence – set in the waning years of the 23rd century – a champagne bottle tumbles through space to strike the newly commissioned Enterprise B. The deep-space christening was conceived originally as a series of three brief cutaways to punctuate an opening scene between Captain James T. Kirk (William Shatner), Captain Montgomery Scott (James Doohan), and Commander Pavel Andreivich Chekov (Walter Koenig). However, the film’s overall length and pacing led to the decision to drop the scene between the original series’ crew members and expand the champagne bottle’s tumbling so that it could play under the opening credits.

But the new plan had a hitch: the original three shots of the champagne bottle, produced as a practical effect by ILM, had never been intended to cut together into a long, seamless sequence. In addition, ILM was already working at full capacity and did not have the resources to take on additional shots. With no choice but to go outside the company to expand the sequence, ILM transferred its footage of the bottle breaking against the Enterprise hull – the only ILM shot to ultimately be incorporated into the new title sequence – to Santa Barbara Studios. SBS had a body of deep space computer graphics work under its belt, ranging from a film on the solar system for the Smithsonian’s Air and Space Museum to a pair of sojourns into the 24th century. “We did the opening comet shot on *Deep Space Nine*,” facility effects supervisor John Grower recalled, “and another comet and alien ship for *Next Generation* in the episode ‘Masks.’ We did a bit of work on their final episode as well, then segued right into the feature.” For the *Generations* title sequence, SBS commissioned Viewpoint DataLabs to produce a three-dimensional model of the champagne bottle – a wire-frame replica that was finessed by the company’s own Will Rivera, then rendered with RenderMan and animated by technical director Ron Moreland. SBS also supplied a drifting starfield using Wavefront animation software.

Five lap-dissolved cuts were required, with the bottle first coming in from infinity, then tumbling through in full-frame closeup to reveal its label and vintage – Dom Perignon 2265 A.D. “The amount of detailing on the bottle of Dom Perignon was amazing,” Moreland marveled. “The bottom of the bottle fills up a sixty-foot screen, so it really had to hold up.”

ILM’s practical champagne bottle had been shot high-speed for its impact with a scaled-up section of hull. The set piece was mounted overhead, allowing shards of broken glass to fall away with a naturalistic zero-G effect. A three-frame transition from the computer generated bottle to the practical element was created by SBS. “We conformed the motion of our model to the ILM shot,” related Moreland, “but there were a number of difficulties in making it work. The original footage they gave us ran about seventy-two frames, and Paramount wanted that stretched out to double-length. But extending the shot diminished the impact, so a lot of hand-painted finessing was required to keep it looking natural and dramatic.” To obviate the need for an optical phase, Paramount elected to have SBS render the titles – created by series visual effects supervisor Dan Curry – and composite them digitally over the bottle shots.

Applauding onlookers watch the christening through a large viewport, cheering the Enterprise B from the orbital drydock housing the new starship. ILM was provided a bluescreen element of the onlookers, shot from behind, to be composited into the viewport scene. “It was obvious that something was missing,” John Knoll recalled. “You couldn’t see their reflections in the glass. We couldn’t just flip their images around to create the reflection, because that always looks flipped. So we made a reflection element from the lights that were inside the viewing room and put it on the glass, then occluded it with offsets of the foreground figures’ mattes.”

An Excelsior-class vessel often seen on *The Next Generation* series and in three previous features, the Enterprise B underwent cosmetic alteration before putting to space. “The Los Angeles production team figured that by changing some details on the model,” Bill George said, “we could make it seem that the Enterprise B in *Generations* was a little further evolved toward the look we see in the next century with the Enterprise D.” Subtle alterations included additional pods on the engine nacelles and a boat-type curve to the lower hull.

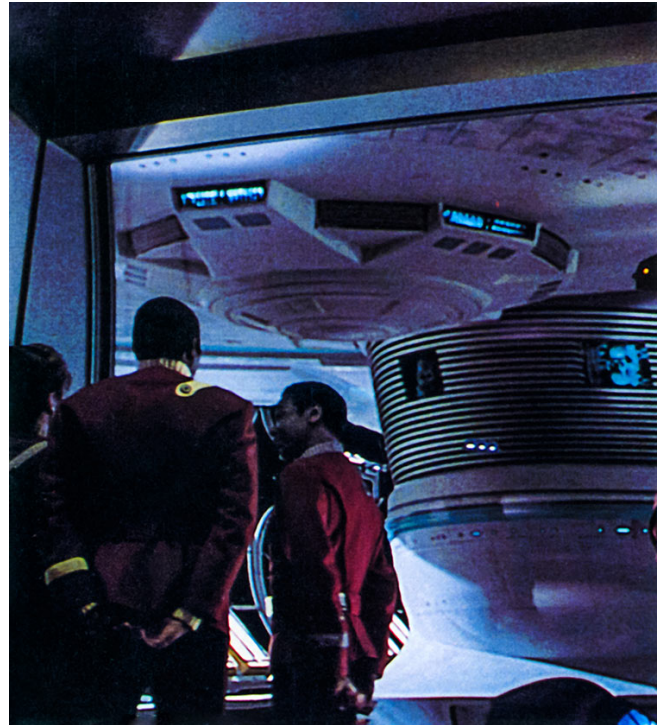


In the title sequence, the newly commissioned Enterprise B is christened with the striking of a champagne bottle against its hull. An ILM practical shot of the bottle impacting was preceded by SBS images of a computer generated bottle tumbling through space.

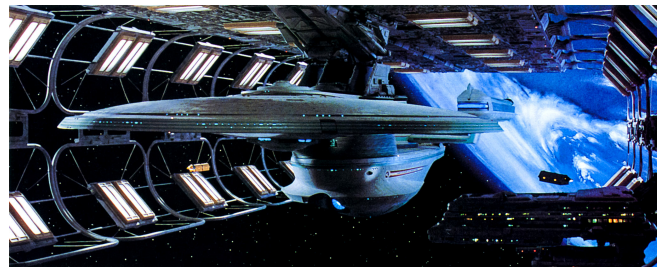
Another model resuscitated for the film was the orbital drydock. Built by Magicam for an aborted Trek TV film in the late seventies, the miniature had been drastically altered by art director Andrew Probert and effects supervisor Douglas Trumbull for its eventual debut in the first *Star Trek* film. It was production designer Herman Zimmerman who unearthed the model. “We had had people searching for the drydock,” Lauritson recalled, “because we felt it would be a nice tie-in with the first film – which the fans would appreciate. Herman had gone to a storage facility to look at some old set pieces, and when he returned from this expedition he mentioned in passing that he had come across the drydock – not realizing what a great find it was for us.”

Like the Enterprise B model, the drydock miniature had to undergo alterations. “Because the Enterprise B is smaller than the original movie Enterprise model,” George explained, “the drydock appeared to be out of scale. So we took the whole middle section out in order to get it sized to the Enterprise B.” Another modification added banks of lights, while a terraced operations section extending from the port side provided a logical spot for the large observation windows seen in the live-action as onlookers celebrate the christening.

With Kirk, Scott and Chekov aboard as honored observers, the Enterprise B departs drydock on its ill-fated maiden voyage. The first of two brief cuts – a tracking shot pacing the ship out of drydock – was accomplished wholly in-camera by Pat Sweeney with a practical starfield in place behind the models. The ‘quick trip around the block’ turns into a crisis when a distress call comes in and the new Enterprise captain, John Harriman (Alan Ruck), reluctantly commits his starship – which is understaffed and not yet equipped for active duty – to a rescue of two earthbound El-Aurian refugee transports. Threatening the transports is a galactically huge, diaphanous energy ribbon of unknown origin.



Guests witness the ceremony from the ship's orbital drydock. Reflections in the viewport glass – created from digital mattes – tied the bluescreen element of the onlookers to the scene.



For a shot of the Enterprise in drydock, ILM resurrected a retired drydock miniature, removing the center section to adjust its scale to that of the smaller ship model.



Understaffed and ill-equipped, the new Enterprise nonetheless attempts an emergency rescue mission that results in the deep-space disappearance of Kirk, presumed dead. The story then jumps to the 24th century where Picard and his Enterprise D crew respond to a distress call from the Amorgosa observatory. Shots of the starship's

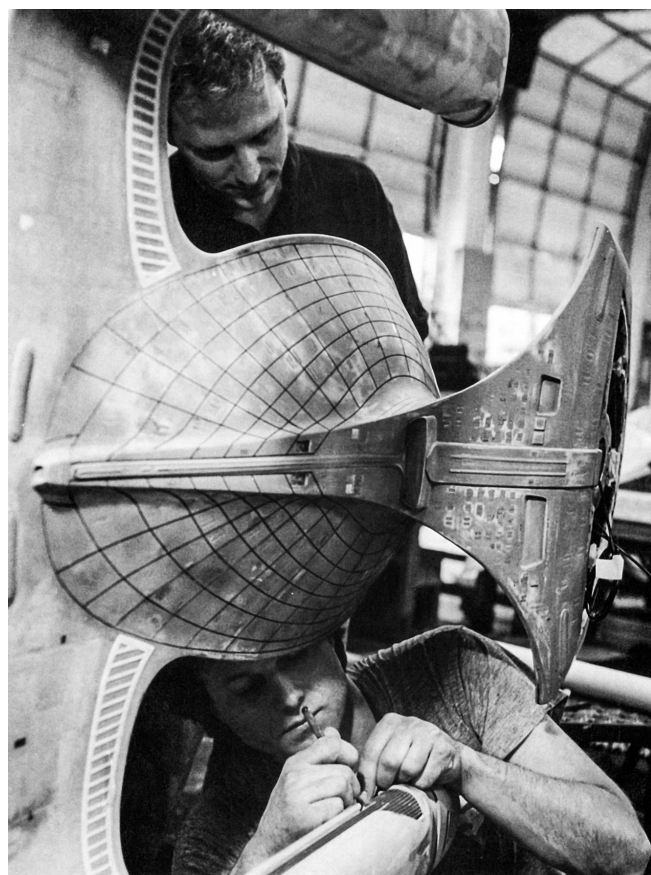
approach utilized a six-foot Enterprise originally built by ILM for the Next Generation pilot.

Charged with creating the energy ribbon – which had been defined only in the most vague terms in the script – was the computer graphics team at ILM which grappled with the concept for some time. “We worked with Dave Carson and Rick Berman to get some design directions for this thing’s movement and appearance,” Bill George commented. “We also relied on diverse reference materials – everything from footage of the aurora borealis to high-speed water droplets. From that, we developed a hybrid look, extracting only what everyone liked from any given reference.”

John Knoll’s original take on the energy tendrils streaming out from the ribbon was derived from a NASA animation of the magnetic field around Uranus. “I thought the tendrils should follow lines like magnetic fields,” Knoll said. “In establishing the topology, we had a big twisty ribbon with an airfoil shape. The tendrils would be either right- or left-handed, anchored on the ribbon’s side and slowly growing outward until they suddenly swap polarity and snap over to the other side. A ship could get in too close to one of the tendrils and suddenly get whacked by one. The problem was that while all this made intellectual sense, it didn’t seem all that dangerous. David Carson felt that the behavior, once observed, became predictable; and so we ended up scrubbing this and going with more of a lightning bolt, electrical look.”

Under the guidance of computer graphics supervisor John Schlag, technical directors Henry LaBounta and Habib Zargarpour were given an unusual degree of freedom in coming up with the energy ribbon effect. “The energy ribbon could have been anything,” stated Alex Seiden. “There was a continuous cross-pollination of ideas between Habib and Henry and the CGI supervisors – all of whom were trying to determine how this fit with the Trek universe and the film as a whole.”

Ultimately, five computer models were created for the ribbon effect, the most distant of which was rendered only twodimensionally. One model was used for a shot of the Enterprise B making its approach. “In that model,” explained Knoll, “only the ribbon core and what we called the seafoam stream – the tendrils coming off the back – were clearly discernible, along with a field of burning-ember-like debris. When we got into the closer shots, we revealed the other elements of the ribbon at a larger scale, which helped communicate the feeling that the ship was becoming engulfed in the immensity of this tremendous force.”



The Enterprise D model had to be thoroughly refurbished for its big-screen debut. Among the cosmetic alterations implemented by the ILM model shop was a new paint job with scale-enhancing highlights. While Generations would feature more computer generated ships than any of the preceding Trek outings, the budget-conscious production recycled several models that had been previously

employed in Star Trek features and television series. Model shop supervisor John Goodson and crew member Nelson Hall detail the Enterprise D.

Shots featuring the Enterprise B and the El-Aurian transports within the energy ribbon would employ computer generated space vessels. Rather than digitize the existing Enterprise model, Stewart Lew

constructed the CG representation from flat-lit photographs of the miniature, while Scott Frankel and Ben Snow performed texturing and touchup work. Again working from stills, they mapped textures onto the CG model using ViewPaint, which allowed the model to be rotated in 3-D space. Since the motion control miniature underwent changes at Paramount's behest, the still photography and texture mapping were updated repeatedly in order to keep both the digital and the physical Enterprise conforming to one another.

In the case of the El-Aurian transport ships, modeled by Rob Coleman, there was no motion control miniature to work from, so the digital model was created freehand. Traditional preproduction artwork was filtered through the digital realm as well. "Bill George would paint textures for the energy ribbon which I quickly mapped onto a shape," Seiden stated. "One of those retouched CG frames ultimately led to a concept we bought off on – so it proved to be a quick and useful process." In the latter stages of rendering, George fashioned a quick-and-dirty physical model to aid in communicating design changes.

The energy ribbon induces gravimetric distortions that wreak havoc with the hull integrity of the trapped vessels – and with a direct tendril hit, one of the ships explodes. With time running out for the surviving El-Aurian craft, Harriman defers to Kirk and orders the Enterprise into harm's way for a rescue attempt. For the actual destruction of the El-Aurian vessels, Paramount suggested that an explosion of a Klingon ship from *Star Trek V* could be reused, with embellishments added by ILM. "Barbara Nellis ported that explosion in," John Schlag stated, "then generated a particle system explosion, assigning one particle per piece of ship. Henry LaBounta also wrote software to lacerate the ship in the earlier stages of the explosion, and there was some procedural opacity mapping which helped punch holes in the pieces, giving them a blasted-apart look."

Just as the second ship explodes, Scotty is able to beam some of its passengers aboard the Enterprise B. The dazed survivors include Guinan (Whoopi Goldberg) and Dr. Tolian Soran (Malcolm McDowell), a man with a secret and nefarious mission. The Enterprise, meanwhile, becomes ensnared within the energy ribbon and faces imminent destruction. In an attempt to free the vessel with an anti-matter discharge, Kirk plunges into the bowels of engineering. The ship breaks free from the ribbon with mere seconds to spare, but a final tendril whacks the Enterprise, ripping a section of engineering open to space and snatching away Captain Kirk, who is presumed a fatality. In truth, however, the indomitable Kirk has been absorbed into a strange pseudo-reality, the Nexus. An obvious metaphor for drug-induced euphoria, the consciousness altering Nexus is so seductive that no one within its grasp has the will to leave it – and it is Soran's desperation to return to the Nexus that fuels his diabolical plans.

Gathering to inspect the damage to the new vessel, Chekov, Harriman and Scott sadly realize that their comrade is lost. The scene included a shot of the view from the gaping hole in the ship – a digital starfield and the jagged edges of the ruptured hull which were rendered on paintbox by Danny Mudget. For the reverse exterior angle – a sort of farewell to the 23rd century – Scott, Chekov

and Harriman are seen fleetingly within the ship as the Enterprise passes slowly overhead. “There’s a huge camera move encompassing two separately-scaled pieces of motion control Enterprise B miniature,” Schlag said. “We were in close on the damaged engineering section, so we needed more detail than the regular model could provide. The actors were shot bluescreen and tracked to match the move so they appeared nestled within the hull breach on the scaled-up section. Combining the two separate motion control miniatures with the live-action was one of the longest, most complicated moves we’ve ever had to composite.”

The action flashes ahead to the 24th century aboard an entirely different kind of Enterprise. Using the simulation technology of their holodeck, Captain Jean-Luc Picard (Patrick Stewart) and his Enterprise D officers enact a longstanding ritual aboard a 19th-century sailing vessel calling for the newly promoted Lieutenant Commander Worf (Michael Dorn) to walk the plank. The sequence required painstaking digital work by Composite Image Systems. “CIS did a marvelous job of painting things out of this sequence,” Moore asserted. “For instance, Worf makes his way out onto the edge of this plank – but from the side view it was clear that he wasn’t anywhere near the end of it. CIS painted the end of the board out – which was no picnic with everything bobbing up and down in the ocean.”

Digital armature removal was required for a shot in which the plank dematerializes, causing Worf to fall into the water. The scene was shot with the plank rigged to an armature that would retract the board at the appropriate moment, allowing a stuntman to effect the fall. “I figured the shot would be done with a locked-down camera,” said Moore, “so we would have the horizon as a moving element, but there would be at least a measure of control over the foreground. Instead, it was shot handheld from another ship. The result was that everything moved. To make matters worse, the stuntman performing the fall fell right in front of the armature, which meant we had to keep him in the shot while removing the armature. It was just a terror.” The plank was made to dematerialize at CIS, where a digital matte painting was created to simulate a clean background without the plank. Flame was used to track the ship’s motion and a camera tilt during the shot, facilitating alignment of the matte painting.

With the good-natured ritual complete, Picard calls for the arch, a console adjoining the holodeck exit. The arch set piece featured in the series was photographed on the docked sailing vessel for the scene. “I figured that for shots requiring bluescreen – which would enable us to composite images of the interior hallway of the Enterprise that you see through the arch – we would shoot the arch on the ship,” Ron Moore said. “But then when it came time to shoot background plates out at sea, we would do those without the arch, knowing that we could comp it back in afterward. We set up early in the morning before the ship left dock, shot the reference footage of the arch in place, then removed it while keeping the camera set up. Once at sea we shot the scene – but it was pretty discouraging to see how much the ship was rolling out there. We knew that would make comping the arch in that much more difficult. Reflections and moving shadows had to be in place with the arch as well, but fortunately we had overcast weather in the morning, so we didn’t have to create really dark, rolling shadows for continuity.” Unwanted elements – such as reflections from camera and lighting equipment on the ship’s glossy deck – were painted out by CIS.

Traditional opticals were also instrumental in completing the sequence. “The production decided to reuse a couple of stock Enterprise D shots from the series,” Moore admitted. “It was a matter of time

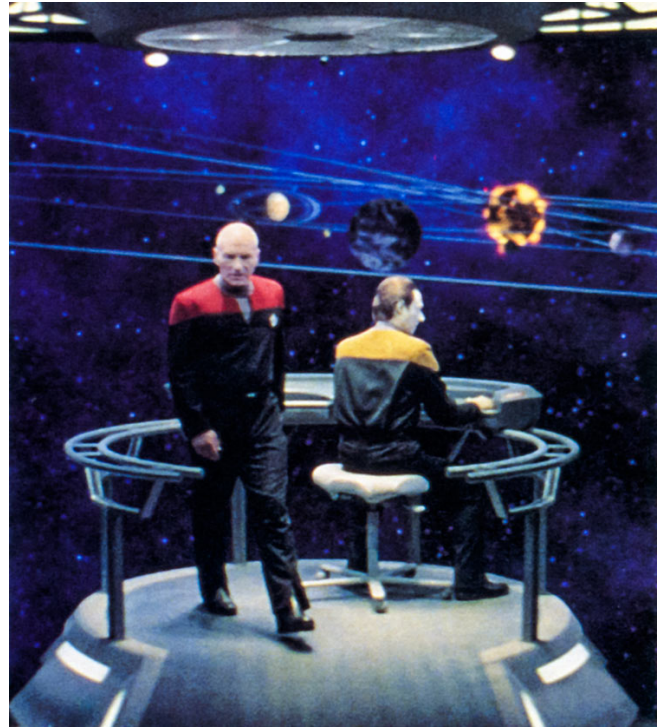
and money; but, in truth, there was no reason not to use them. So we dug up some shots ILM had done for the pilot episode. They were generic shots, and we had comped them a lot of times. We considered doing the recompositing of these shots on the computer, but since the elements had been shot Vistavision initially, I suggested that we have them done optically by Jeff Matakovich at Optical Illusions." The worn film elements were a problem, however. "The film had more weave and motion than we liked; so, very quickly and economically, Jeff made cover mattes and assembled the comps."



Behind the scenes in the stellar cartography section where Picard and Data (Brent Spiner) trace the projected path of the energy ribbon on a three-dimensional star map. Stationary shots of the map were achieved with giant translites mounted on screens surrounding the cylindrical set.

Back in 1987, ILM had built six-foot and two-foot miniatures of the Enterprise D for the series pilot. These models saw heavy use until the third season, when a four-foot version constructed by Greg Jein supplanted the originals. The larger ILM model was then relegated to special-use situations, such as saucer separations – a function the new model was incapable of performing. Jein’s Enterprise D was still being used for the final episodes of the series when Generations effects work got underway, and a determination was made that the six-foot miniature, if thoroughly refurbished, would best serve big-screen requirements. In an early meeting, Rick Berman charged ILM with polishing the look of the starship model. “Rick said that people who watch the show have fallen in love with the Enterprise,” Bill George stated, “and when they see it in the theater, they should fall in love with it all over again. So we took it to the body shop and pounded out the dents, then went to work on the paint job.” The 24th-century starship was painted battleship gray – with glossy highlights, long a bane of bluescreen work, added to areas of the ship as well. “Now that we’ve entered the digital realm, we don’t have the same enormous problems we once did with blue spill. John Knoll felt that adding these glossy areas – where there would be glints of reflected light – would really help the scale.” Embellishments, such as the accentuation of numerous emergency ‘lifeboats’ visible in relief along the hull and scale graphics identifying each of them, provided additional detail.

For shots showing the starship’s jump into warp drive, Knoll looked forward to improving on his previous effort, which incorporated a flash of light to disguise the jump between the six-foot model used for the motion-control lead-in and the two-foot model employed for the slit-scan warp ‘stretch.’ “The original animation for that effect was all 2-D,” Knoll explained, “so the nacelles didn’t really occlude the light effect as they would in reality. This time out we made sure they did, by creating a CG Enterprise and



For shots requiring that moving star systems and blinking icons be viewed on the screens, the static translites were replaced with bluescreens to facilitate the compositing of computer generated elements created by SBS.



On its approach to Veridian III – the uninhabited planet from which Soran intends to launch a missile and effect a cataclysmic stellar explosion – the Enterprise suffers a devastating surprise attack from a Klingon Bird of Prey. For views of the planet from space, ILM created a computer generated globe texture-mapped with digitized photography of acid-treated sheet copper.



Sustaining lethal damage to their ship, the Enterprise crew evacuates to the saucer section which separates and

stretching it. As a result, the ship's clear definition during the jump to warp speed has much greater presence. The ship really stretches, and the internal lights remain on throughout the effect since there is no abrupt jump to a different model." The generated-on-video starburst marking the ship's warp entry was another effect Knoll deemed worthy of upgrading. "I designed it to have a little more motion; and the way the flare tapers and fades makes it look more like an actual light. It's a similar look to previous warp entries, but more polished."

races toward the planet as the abandoned stardrive explodes.

Responding to a distress call, the Enterprise D approaches the Amorgosa solar observatory – conceived by art department illustrator John Eaves and built at ILM – and the Away Team transports over to the station to search for survivors. The transporter effect was another redesign effort. Instead of customary vertical streaks appearing over each person's profile, curved streaks which suggested the transportee's actual body contours were made to flash downward. "We went in with Flame and redid the beaming effect," Moore said, "which wound up being a bigger deal than we had hoped. We didn't have a 'master' transport effect that could just be plugged in, as we did on the series – instead, each person being beamed had his or her own custom effect. It took days, instead of the hour or so we were used to; but Flame really brought out the dimensionality of it." Created at CIS, the transporter effect was also composited with Flame. Additional touchup work, used to add subtleties that would integrate the effects and live-action, was done in the facility's electronic paint and effects suite.



As conceived by David Carson, the crash landing of the Enterprise on Veridian III was an extended sequence of shots in which the saucer rips through miles of rain forest before finally coming to a stop. Chief modelmaker Larry Tan at work on the twelve-foot fiberglass saucer model employed in the crash scene.

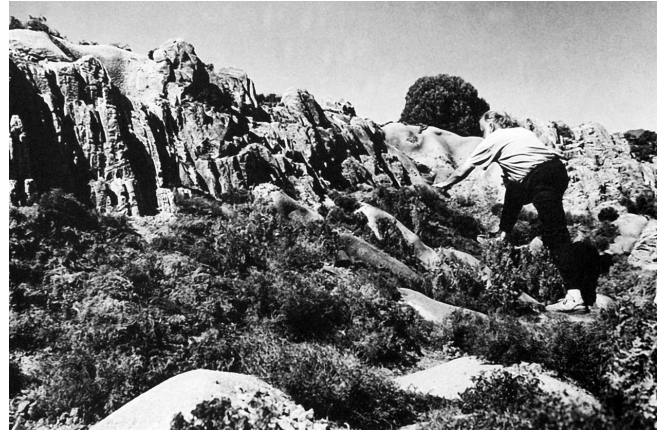
As discovered by the Away Team, the station is site to a massacre. Only Soran – last seen ranting aboard another Enterprise seventy-eight years earlier – is found alive, buried under rubble. Responsible for the attack are Romulan raiders intent on uncovering trilitium – a Trekian pseudo-isotope capable of halting fusion within a star’s core. Soran convinces Picard to allow him to continue his work on the station – the true purpose of which is to change the course of the energy ribbon so that he may reenter the Nexus. Data (Brent Spiner) – waxing comedic with his new emotion chip – assists Geordi La Forge (Levar Burton) in investigating Soran’s probe facility, and discovers the trilitium. Soran intercedes – knocking La Forge unconscious when Data’s chip malfunctions – and launches his probe into the sun, causing a quantum implosion.

The doomed star was modeled in the computer as a simple sphere, with solar flares created through a custom lens flare simulator program. “John Knoll did the flares coming off the surface of the sun on his PC,” stated Schlag, “but they were comped on Silicon Graphics systems. Doug Smythe worked on the collapsing star and resulting shockwave. There was a lot of shader work on the sun as it undulates throughout, with a lot of displacement going on. Darker areas form outside while lighter spots within the star begin to show through.”

Commander William Riker (Jonathan Frakes) and Worf beam to the observatory in an attempt to save La Forge and Data from the impending shock wave, only to find themselves in a fire-fight with Soran. “Soran’s disruptor – a Klingon weapon shooting yellow and green balls of light – is set to kill,” Moore noted, “unlike the good guys, who keep their phasers on ‘stun.’ Consequently, there were explosions going off all over the set. Except for the on-stage pyro, all of the interactive light in the battle was done in post. Danny Mudget did a set of cels for the phaser fight on paintbox – they were beautiful. Danny’s work was dead-on in terms of perspective and screen direction, and very subtle; when Worf fires, his features light up without getting washed out.”

A *Bird of Prey* under the command of two troublesome Klingon sisters cartwheels into view while decloaking – a digital version of the effect produced by ILM which matched previous ripple-glass cloaks. The old Klingon vessel grinds to a stop relative to the station, then beams Soran and La Forge aboard. The Klingon transporter had been an effect conceived on the fly for the series by Dan Curry and Ron Moore, and neither had been particularly satisfied with the results. Seizing the opportunity to make improvements for the feature, Moore prepared a demonstration of a revamped transporter effect – realized by Scott Rader at Digital Magic – then went to CIS to accomplish the finalized effect.

The Klingon ship disappears and the Enterprise warps out of danger a hair’s breath prior to the observatory’s destruction by stellar shockwave – again accomplished via particle animation. Picard



Chief modelmaker Lorne Peterson dresses the eighty-foot-long landscape miniature used to represent the crash site. Oblique views of the crash were obtained by flying the model on cables that were later removed digitally. Other shots were achieved by mounting the saucer to a truck-powered dolly rig concealed beneath the landscape set.

and Data, attempting to get a lead on Soran's whereabouts and intentions, venture into the ship's never-before-seen stellar cartography section to trace the projected path of the energy ribbon. Santa Barbara Studios was Ron Moore's first choice for executing the sequence, which would require bluescreen elements composited onto giant screens. "The set – resembling a giant 3-D planetarium – was cylindrical in shape, measuring thirty feet in diameter and standing sixty feet tall," Moore explained. "It contained three huge curved screens covering three hundred degrees of view. When I saw the set for the first time, I thought, 'Uh-oh, this is going to be murder.' I thought we would either end up laying out a huge amount of bluescreen – which would take forever to light – or we would have to bring the bluescreen right up close to the set. But the Golden Rule is: Never put a bluescreen right on something – you need separation. So I decided to use Stewart bluescreen with Kino Flo lights – lights that are manufactured specifically for bluescreen work and really help matte extraction. We used practically their whole supply of white lights, mounting them in three banks wired to dimmers."

The stellar cartography sequence featured both bluescreen elements and large translites. "Initially," animation supervisor Eric Guaglione explained, "the characters are looking at huge backlit translites, depicting a galaxy, which were produced by the art department. There are colored clouds of interstellar dust to create a sense of depth, and sections are labeled like a star chart. The idea was that, with the translites, they could establish a look for the scene and cut down on the number of opticals required. Then, as Picard uses the system and the view changes, the translites could be pulled and the bluescreen inserted." While the unidirectional, primarily overhead stage lighting was fine for shooting the translites, Guaglione encountered considerable difficulties with it when it came time for the bluescreen work. "The set was silver and very reflective. Even after they had hit it with a couple of hundred cans of dulling spray, it was still picking up spill from the screen, which curved to match the contours of the set. From a compositing point of view, that was pretty challenging." SBS eventually wound up having to do a number of articulated mattes to eliminate the remaining spill.

In a zoom effect, Data directs the screens to trace the energy ribbon's path. "We go into this graphic," said Guaglione, "but it is not presented as a flat 2-D effect. They fix a particular point on the display to scale up, and an icon comes on to wipe the screen. As it does, the stars and gases contained within the icon scale up with it, and then it locks into place while additional graphics and logos appear. The zoom-in expansion was done with software created here by Jim Hourihan which Wavefront sells under the name of Dynamation."

"There were limits to what we could do with the zooms," animator Mark Wendell explained, "because our start-and-stop points were going to be these static, 2-D translites. There were two different sets of translites for each screen panel – six in total. One would depict the start point and the second was revealed halfway through the sequence. So we added dynamics by introducing volumetric movement through these stellar gas clouds. We did the stars and gases on an SGI Onyx workstation. With Reality Engine graphics, we can handle real-time display of texture maps, so I extracted gas textures from the actual translites and painted them using PhotoShop. Then I positioned the texture maps over individual moving elements with a particle system – which the SGI was able to render very quickly. As a result, we never had to go out to a separate rendering

stage. We got broadcast and film quality work done without having to expend the time involved in using something like RenderMan.”

Picard learns that the energy ribbon is headed to the Veridian system —depicted on the screens through SBS computer graphics – and orders the Enterprise to Veridian, soon catching up with the still-cloaked Klingon ship hovering over the system’s third planet. “It was decided early on,” Bill George recalled, “that we would be using a computer graphics approach for depicting the planet Veridian III as seen from space. But we needed some kind of interesting texture to map onto the CG globe.” Experienced in acid-etching metals, George hauled a four-foot sheet of copper into the ILM parking lot. “I started pounding it and stamping on it. I did some sandblasting, then sprinkled it with salt and a mild acid called Patina Green before leaving it out overnight. In addition to etching the metal, this also created copper oxide, which is a nice, bright green color. The depressions in the copper caused the acid and the salt to pool in certain areas, creating different layers of coloration.” The result was photographed, painted by digital matte artist Paul Huston, and mapped onto Alex Seiden’s computer generated planet model. Multiplane clouds and sunlight reflections were added to give depth to the illusion.

Picard winds up on the planet’s surface alone with Soran and attempts to talk the scientist out of launching his deadly probe – now housed in a full-sized practical rocket designed by Herman Zimmerman and Clark Schaller and built by Aerotech. While the one-on-one confrontation plays out on Veridian III, the orbiting Klingons open fire on the Enterprise, piercing her shields and devastating the starship.

The challenge for ILM was to form a strategy for shooting the ship battle with a minimal number of shots and no budget for pyro. Frame-grabbing from previous films led to a look for the warring ships’ armaments. “I liked the photon torpedoes that Apogee did for the first film,” John Knoll commented, “which were shot in smoke with a laser hitting a crystal. The shards of light coming off a hot core were very nice, so I modified my lens flare generator to emulate this. The program combines with any animation file we want, so the torpedoes became simple to do.” Phasers and disruptor beam blasts were done by Don Butler, a former Harry artist now working on Unix.

Phaser and disruptor beam hits on vessel deflector shields – ingeniously handled on the series through digital manipulation of a mylar pompom – went through several iterations before a sufficiently textured and dimensional look evolved. The shields – as yet unseen in the films – maintained their shape, but since the shots in the film were essentially closeups, the detail glimpsed in each



Having successfully launched his missile, and thus manipulated the course of the energy ribbon, Soran is embraced by the light on a Veridian III mountaintop. The design of the nebulous energy source was particularly problematic for effects art director Bill George and the digital artists at ILM. Once the electrical look of the ribbon had been defined, the team realized the effect with a variety of computer animated models.



Enjoying a brief foray into the Nexus, Picard meets with a cheerfully delusional Kirk and persuades him to return to

flaring impact was yet to be determined. “John Knoll would come up with new texture for the shields,” John Schlag explained, “then give it to me to wrap around a 3-D object in Softimage. From there it would go to compositing for the motion control elements.” Shots featuring a distant *Bird of Prey* firing on the foreground Enterprise created such spectacular results with the shield hits that it was deemed necessary to de-emphasize the Klingon ship in frame. “Its presence seemed to take away from the shield effect, so we resized it. This resulted in the creation of a 2-D Klingon ship, smaller in the frame, darting back and forth while firing.”

the real world so that Soran’s catastrophic course may be altered. Both Kirk and the madman are killed in the ensuing conflict, after which Picard is shuttled to the downed Enterprise where his crew awaits evacuation. ILM staff members were outfitted in Starfleet uniforms and photographed as stand-ins for the crew. That photography was then composited with a matte painting of the saucer and surrounding terrain.

While the attack proves lethal to the Enterprise, its crew manages nonetheless to dispatch the *Bird of Prey* with photon torpedoes. The Klingon vessel’s destruction was a straight stock shot culled from the climax of *Star Trek VI*. With an unstoppable warp-core breach in progress, the Enterprise crew hurriedly evacuates to the ship’s saucer section, detaching from the doomed stardrive which explodes shortly thereafter. Particles resembling those seen in NASA film of actual stagings drift and glitter as separation is accomplished.

The saucer section is forced to make an emergency landing in the less-than-optimum locale of Veridian’s rain forest, amid towering trees. In electing to stage the crash outdoors, ILM boldly went where few had gone since the Lydecker brothers and L.B. Abbott. Knoll initially decided on a twenty-four-foot saucer – but budgetary and practical rigging considerations, together with the limits of the available terrain, led to the determination that a twelve-foot fiberglass model would suffice. “Going with a smaller model made it easier to rig and less expensive,” Knoll explained, “but it also caused depth of field problems and forced us to shoot at a higher frame rate than we would have liked.”

A Veridian landscape model was also constructed for the sequence. “To create the impression of a vast area,” noted Bill George, “John Goodson came up with the idea of adding some cliffs to the miniature. This brought the horizon line up, giving us more set to shoot against.” The eighty-foot-long model accommodated a second camera as well, allowing for additional angles which the truncated budget had not permitted. “Getting two shots out of one setup is very ambitious,” Alex Seiden said, “but by cheating everything in favor of the A camera, then hunting for a decent spot for B camera, we were, in some instances, able to do it.”

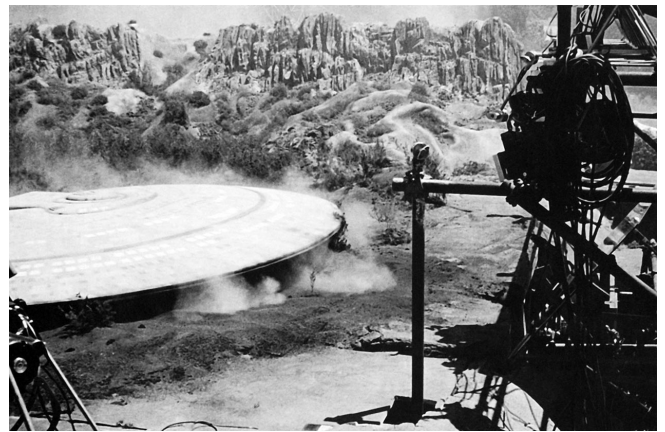
The high-speed shoot was realized in direct sunlight behind the ILM facility. “What appealed to me about the sequence,” George revealed, “was that it was not at night and there were not a lot of clouds or smoke to obscure the crash. You got to see everything. Dave Carson wanted intercutting between the ship hitting, the crew inside reacting, then back outside as the ship hits again and again. He wanted the saucer to land unevenly, with its sides touching down at separate times. We put a lot of energy into creating visual dynamics to fulfill his ideas on the crash.”

Kim Marks who shot the crash sequence, employed varied techniques to illustrate the starship’s final descent. For oblique views revealing the terrain beneath it, the model was flown on cables which were later removed digitally. Most of the shots, however, were attained with a truck-powered dolly rig. “The saucer was mounted on an extendible post that ran down beneath the set,” Knoll

explained. “We had two guys underneath controlling the saucer’s motion from this cart, which had pulleys attached and was connected to a rental pickup.”

For the first shot of the saucer touching down, an extreme up-angle was sought – as if an onlooker on the surface was watching a multistory building drop down on him. The entire foreground was photographed separately. “In order to mask out certain elements of the landscape model,” George noted, “we shot a number of foreground tree elements. We did this for a couple of reasons. In some shots we couldn’t carry focus all the way, while on others we couldn’t detail the set sufficiently due to windy conditions.” The trees – ten to fifteen feet tall – were filmed bluescreen and served as strong compositional elements in the low-angle shots, framing the crash and firmly establishing mother nature’s handiwork as looming threats to the careening saucer.

The crash footage was transferred into Sabre – a Harry-like high-speed compositing system developed by ILM – where the foreground tree elements and camera shake were incorporated. “Sabre is really good at pulling matte extractions from the sky,” said Seiden, “so we were able to split that out and lose telephone wires and such.” Substantial color corrections were made to match the outdoor crash footage to main unit production lighting of the planet. Multiple layers of moving, matte-painted clouds were added to the background as well. “We put it together from a digital matte painting Yusei Uesugi had done of the ship surrounded by forest,” Schlag explained. “He did a concept demo, cutting his matte painting apart into several pieces. Then he created a sort of multiplane boom to execute some simple morphs on each piece, emulating perspective distortion. Since the pieces are separate and layered over one another, as you move up, you get something like a perspective change. The result is a very convincing effect.” The test was quickly approved, and soon the Silicon Graphics systems were running the program, with Uesugi reproducing his work for a final shot that would run some three hundred frames.



A camera setup for the crash scene. Effects director of photography Kim Marks staged the high-speed sequence outdoors, using models and miniature settings erected in the ILM parking lot and in a nearby vacant lot. The crash site was designed to include high cliffs in the background that would mask the horizon and thus afford the film crew maximum flexibility in determining shooting angles.

As the surviving members of the Enterprise crew recover from their rough landing, Picard attempts to dissuade Soran from launching his missile – an act that will cost millions of innocent lives.

Unsuccessful in his endeavor, Picard can only watch helplessly as the probe is launched and the Veridian sun implodes, causing the energy ribbon to alter its trajectory and engulf the two men. Moments later, the shockwave impacts the planet. “After Picard and Soran are absorbed into the Nexus, the energy ribbon leaves Veridian in one shot,” Alex Seiden described. “Then the shockwave tears across the planet’s surface – a destructive wave of force moving from the back of the frame forward, finally reaching the foreground and enveloping the Enterprise saucer section. Next is a shot of Veridian from space as the wave rips the atmosphere right off the planet, which then explodes.” Pyro debris footage was scanned in and incorporated for the planetary disintegration which was preceded by digital renderings of Veridian III, the energy ribbon and the shockwave. All of the disparate images were pulled together by Habib Zargarpour.



A scaled-up section of the saucer rim was constructed for closeups of the ship impacting with trees as it careens through the Veridian rain forest. In the parking lot preparations are in progress for a closeup of the saucer rim against a painted cloud backdrop.

In the dream-fulfilling Nexus, Picard finds himself sharing an oddly anachronistic, quasi-Dickensian, veddy proper British Christmas with the wife and children he never had in real life. Overwhelmed by the added presence of his deceased nephew, Picard appears ready to accept this fantasy as reality – but before he can settle down to roast goose and plum pudding, Guinan appears, explaining that she is an ‘echo’ remaining in the Nexus after the woman he knew was transported to safety by the Enterprise B seventy-eight years previously.

Through Guinan, Picard learns he can leave the Nexus and return to his universe at any period in time; so he vows to return to Veridian III to stop Soran before the missile is launched. Seeking help in his mission, Picard finds it in the form of Captain James T. Kirk, ensconced in timelessness since being engulfed by the Nexus. The thematic debate concerning reality versus illusory fantasy has been part and parcel of *Star Trek* since Gene Roddenberry wrote “*The Cage*,” the original series pilot. Inevitably, the noble-minded characters choose to abandon their fantasies to live (or die) in the real world – a lesson many of the show’s diehard fans have yet to take to heart. In his tenure as captain of the Enterprise, Kirk had walked away from – or eradicated – countless false Edens, but this paradise holds him in its thrall until he discovers he cannot die here. Only then does Kirk agree to accompany Picard back to reality, and the pair exit the Nexus to confront Soran.

As originally filmed, Kirk engaged in old-fashioned fisticuffs with Soran while Picard sabotaged the probe. But the climax of the sequence – in which Kirk is shot in the back and Picard kills Soran with the scientist’s own disruptor – failed to register strongly with the test audience. Ron Moore also found the execution of Soran troubling and the death of Kirk – a momentous event in the *Star Trek* universe – far too casually treated. “In the original version of the scene,” Moore explained, “Picard just blew Soran way. Whoa! Picard shooting down an unarmed man? And Kirk was suddenly gone,

just like that, without any fanfare.” Overall, the climax lacked impact, and an autumn reshoot was scheduled.

Weather conditions in the desert location were much more tolerable in the autumn, and work proceeded at warp speed. An elaborate series of bridges and scaffolds were erected, creating a variety of distinctive locales for the extended action scenes. Even so, Kirk still fares poorly, needing twice to be rescued by Picard before making one last great fearless leap – followed by a long fatal fall from a collapsing bridge. “Picard and Kirk see Soran’s remote control for the probe on the other side of the bridge,” Moore recounted, “so Kirk goes after it and decloaks the missile right before the bridge falls. It was much more active and exciting than the original ending – and it let Kirk go out like a hero.”

A view of Kirk’s precarious position on the collapsing bridge was shot on location, then enhanced with a digital matte painting by Robert Stromberg of Illusion Arts. “The distance of the drop was not severe enough on location,” Stromberg said. “The producers wanted to extend it so it would look like Kirk was in more danger. On location they had a ten-foot drop to a platform that had been built – we extended that so that it looked like a real chasm below him. We also did wire removal, because there were all kinds of cables on the collapsing bridge, and people removal to take out all the crew members and effects guys that were around. After removing all of that, we digitally rotated the bridge so that it would appear to be dangling at more of a severe angle. We also added a CG piece of metal debris falling from the bridge into the chasm. It showed how unstable the bridge was and how far down the chasm went – just an added bit of movement to make the painting more convincing to the audience. We used PhotoShop and CoSA After Effects and our PowerMacs to complete the shot. It was quite a bit of work – and we did it in about three days.”

As Kirk goes down with the bridge, Soran drives Picard away from the probe, but not before the captain manages to lock it in place. The trilitium warhead explodes on the launch pad, killing its crazed creator. Though ILM had fashioned a split-scale miniature of the mountaintop explosion, the model shot – recorded on film prior to the live-action pyrotechnics – ultimately proved extraneous. “Paul Lombardi did a great job with live explosions on the set,” Lauritson noted, “and the ILM shot – while it looked great – didn’t really cut in very well.”

After burying Kirk, Picard is picked up and returned to the Enterprise crash site via shuttlecraft, finding his crew securing and evacuating the downed saucer. ILM staffers stood in for the crew and were comped in atop the large dish. “A rescue shuttle appears and flies by as the crew gather on top of the dish,” said John Knoll. “The shot was a pan following the motion control shuttle, so we had to match-move the matte elements – all of our guys in Starfleet uniforms, plus the saucer, which was a matte painting.” Two paintings – one including glints and highlights, the other rendered flat – were combined to give dimension and relief to the pan over the craft, while faint cloud shadow elements were introduced over portions, reinforcing the impression of the ruined ship’s great size. “Since the view of the shuttle suggested a wide-angle taking lens, we wrote software to simulate veneer subliminal barrel distortion that you get when you pan a camera across a scene. That really anchored the shot in reality.”

While a standard, series-issue shuttlecraft retrieves the captain, a number of other types of craft were involved in the evacuation, including series shuttlepods and a shuttlecraft Bill George had

fashioned for the trip to spacedock in *Star Trek VI*. In addition, three different classes of Starfleet vessels appear, including two starships built by ILM for earlier films. The third, the Nebula-class Farragut – built by Greg Jein as the Phoenix before undergoing a thorough makeover by John Goodson's model crew – had appeared irregularly on *The Next Generation* since its fourth-season debut. The film closes as the starships depart the planet, sunlight glinting off their hulls as they warp off into space.

Whether or not *Star Trek Generations* lived up to the hype and scrutiny it endured as its release date neared will be a matter of debate among Trek aficionados for some time. But regardless of how the film ultimately fares when compared with earlier Trek features, it will remain a major turning point in the *Star Trek* saga – the point at which the mantle was handed from one generation of starship explorers to another.

To those who labored to bring the effects of *Star Trek Generations* to the screen, the movie also represented an exercise in stretching effects dollars, and getting as much bang for the buck as possible. “We all banded together in a kind of guerrilla warfare in order to get the number and quality of effects shots this film needed,” David Carson commented. “If not for the ingenuity of John Knoll and all the effects crews, we could not have done it on the budget we had. It was terribly difficult and frustrating at times; but to see those shots on the big screen for the first time, to see the Enterprise come into frame – that was terribly exciting.”

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THROUGH THE STARGATE

image

article by
Mark Cotta Vaz

The urge to shake off shackles of the natural world and magically transport to far-off wonderlands has forever manifested itself in humankind's collective imagination. The conveyances imagined have been wondrous and varied – heaven-bound chariots, soaring magic carpets, a song to take one over the rainbow. Even modern-day scientists have explored this common wanderlust, mulling over time travel theories and the possibility of black holes bridging time and space.

Stargate a winter MGM/UA release, provided audiences with a novel device for making the leap to the far side of forever. In the film, a ring-shaped portal – discovered buried in the Egyptian sands during a 1928 archaeological dig – has been relocated in the present to a top-secret, reconverted nuclear missile silo in Colorado. When Egyptologist Dr. Daniel Jackson (James Spader) cracks the hieroglyphic code etched on the portal's outer ring and activates the ancient device, he and a team of soldiers – led by the grimly determined Colonel Jack O'Neil (Kurt Russell) – step into the vast unknown. On the other side they find themselves on a distant planet whose inhabitants live like ancient Egyptians – a world where Ra (Jaye Davidson), the sun god, rules with an iron fist.

Prior to its release, *Stargate* had generated some expectant buzz within the film industry. At a special screening, the effects – including the ride through the stargate, the descent of a massive pyramid spaceship and a variety of morphing effects – were spontaneously cheered. Ultimately the film would emerge as the surprise hit of the season, setting boxoffice records and generating upwards of \$70 million in domestic grosses.

Stargate director Roland Emmerich and producer Dean Devlin had envisioned the film five years earlier during a brainstorming session which married Emmerich's fascination with the mysteries of the Great Pyramids and Devlin's idea for a 'Lawrence of Arabia on Another Planet.' Indeed, the resulting script, which the duo began shopping around in 1990, generated considerable interest – until studio budgeting analysts estimated it would cost \$100 million to fire up the film. Meanwhile, Carolco Pictures chief Mario Kassar hired Emmerich to direct *Universal Soldier*. With the resulting success of that film, Emmerich and Devlin attracted backing for *Stargate* from Carolco and Le Studio



A surprise hit of the winter season, Stargate infused new life into the science fiction genre, combining a rousing interplanetary tale with imaginative visual effects. Writer-director Roland Emmerich – committed to bringing the production in for half its original budget estimates – shot much of the film's exotic locales in the Arizona desert including opening scenes of an Egyptian archeological dig where the mysterious stargate is first unearthed.



When Egyptologist Dr. Daniel Jackson (James Spader) deciphers the hieroglyphics on the ancient stargate, the activated device opens a gateway to another part of the galaxy. Passing through the portal, Jackson and a party of soldier-explorers find themselves on a desert planet whose human inhabitants appear to be much like ancient Egyptians. Jackson examines a mastadge, a domesticated beast of burden used by the desert dwellers.

Canal+. The only hitch was that the filmmakers were committed to produce the movie in the \$50 million range – a big-time, big-budget production, but still half of the original estimates.

The enormity of the production challenges – particularly in regards to the effects – became crystal-clear during preproduction. In the months prior to filming, Emmerich considered a variety of visual effects companies, finally visiting the Kleiser-Walczak Construction Company facility in Lenox, Massachusetts. Kleiser-Walczak had set up the facility specifically to produce computer animation effects for Douglas Trumbull's *Luxor* film attraction. "We described to Roland our production strategy for the *Luxor* project," co-owner Jeff Kleiser recalled, "which involved bringing a team of top-notch animators, support personnel and equipment into our client's facility for the duration of the project. Since only essential people and equipment are assigned to the project, the money goes straight to the screen – overhead is cut to a bare minimum. We told him we were prepared to do the same thing for *Stargate*, setting up our team next door to his editorial department. Since Roland wanted to be involved in the design of the computer effects, this strategy would provide him daily interaction with our creative and technical teams. On the way back to the airport, he told us we had the job." Kleiser-Walczak then proceeded to set up a facility at the Carolco building in Los Angeles, bringing in a team of seasoned animators, an array of Silicon Graphics workstations and render servers, and a *Solitaire* film recorder. The facility was completely self-contained, with the exception of film scanning which would be sent out to Cinesite, and film processing, which would go to Deluxe and CFI.

Brought on as visual and digital effects supervisor for the production was Jeffrey A. Okun. After doing shot breakdowns, Okun discovered why some wary studio executives had viewed *Stargate* as a budget buster. "The original effects breakdown I did for the film had us with about three hundred effects shots – which would have cost something like twenty million bucks," stated Okun. "We had to get that down to a reasonable number of shots. Roland and I went through the script and determined what was needed to tell the story and what could be sacrificed. By the end of preproduction we had it down to 51 shots – but that grew to 287 by the time the film was completed. We ended up with a budget of \$2 million for all the effects – including the plate photography. Roland told us from the beginning that he didn't want anything to look too whimsical or too fantastic. He wanted every effect in the film to look as if it could be real."

While the majority of the work would be achieved by Kleiser-Walczak, other companies also had a hand in the magic. Cinema Research Corporation provided major compositing support, Available Light realized specific animation effects and Patrick Tatopoulos supplied the creature effects. Tasked with devising the practical and mechanical effects was effects supervisor Kit West. For all of the effects teams, *Stargate* would prove to be an arduous creative journey. Production and budget realities often required the filmmakers to improvise on the run, even changing key story points and crafting pivotal effects months into the postproduction process.

Despite budgetary concerns, the production would employ massive location and soundstage sets that recalled Hollywood epics of the past. Production designer Holger Gross – who had worked with Emmerich on *Universal Soldier* – created a motif that blended both Egyptian iconography and high-tech hardware. "We were dealing with a parallel evolution of an Egyptian culture," stated Gross. "There was a harmonic look to things – big triangles, squares, simple shapes, which disguised the inner, technical look. As a whole, the design scheme was to stay as simple as possible." This

essential design objective extended even to the plot-pivotal stargate. Despite its conceptual simplicity, however, the stargate would be a complex mechanical set piece. Kit West and his team constructed a twenty-two-foot-tall metal portal covered with fiberglass and equipped with an electrically-powered outer ring that could rotate like an enormous combination lock. The activated stargate – conceived as a rippling planar surface within the ring – would be one of Kleiser-Walczak's key visual effects sequences.

When Daniel Jackson cracks the stargate code – causing a fluid-like eruption from the ring – the desired effect was considered too complex to achieve strictly with computer graphics. Instead, Kleiser-Walczak generated practical elements of an explosive blast and a vortex effect. Shooting wet for dry, the effects team used five hundred gallons of water to fill a glass tank that was three feet tall and two feet in diameter. For the first test, an air mortar was placed above the water's surface and cranked to an air pressure of 230 pounds. "We had no idea how much air we needed to release to get the effect we wanted," Okun recalled. "We pushed the button and it blasted this stream of air into the tank that raised the water as an intact cylindrical unit four feet into the air and two feet over – with all five hundred gallons coming down on the head of my cameraman. There was no spray – the water rose up as a single zero-G unit. It was wonderful – the best laugh we had on the show." For the final effect, only thirty pounds of pressure was directed into the water. "Once we got the blast and the vortex, we used the computer to pull various mattes, stretch them, and add a few highlights to make it all come together."

A full complement of digital artistry would be needed for the activated stargate effect as members of Colonel O'Neil's Away Team penetrated the watery gateway to another world. Shots of the team stepping through the stargate were filmed at the enormous Long Beach, California, dome hangar where Howard Hughes' famed 'Spruce Goose' airplane was exhibited for years. A brilliant light effect was accomplished by putting a six-foot ring of mylar some fifty feet behind the stargate, then filling the entire hangar with smoke and blasting two xenon lights through the mylar ring. "Kit West filled the whole dome with mineral oil smoke in about ten minutes," Okun commented, "which was amazing because the dome is something like 120 feet high and 322 feet in diameter. Usually, you would shoot smoke like that as a separate pass, but Roland wanted to see the dramatic shafts of light in dailies. If we had done it the traditional way, we would have had to separately shoot the actors bluescreen, trying to match the lighting and so forth. But by shooting it as one unit, everything tied together – the interactive light was there, the silhouettes of people, all the subtle shadows and details." Okun did, however, shoot an additional light element in a black, smoke-filled room to get a clean set of light rays that could be used to enhance the on-set effect.

A bluescreen was placed in front of the actors – but to the side of the ring to avoid obstructing the mylar light effect – to allow for the subsequent compositing of Away Team members into the rippling surface. The mineral oil smoke was so thick, however, that it obscured the screen, so Okun replaced it with a red screen of better contrast value which allowed mattes of the actors to be pulled.



Assuming much of the visual effects workload was Kleiser-Walczak Construction Company, under the direction of visual effects supervisor Jeffrey A. Okun. For an establishing view of the archeological site in Egypt, digital artists composited a photograph of the pyramids of Giza onto a live-action plate of an Arizona desert locale. Filmed midday, the shot was digitally altered to effect a sunset view.



Moments before stepping through, Jackson touches the fluid membrane spanning the activated stargate. The computer generated effect – designed to resemble liquid mercury – utilized an advanced particle system to imitate the way in which liquid surfaces react.

The stargate surface element – dubbed the meniscus – was a computer graphics effect designed by Kleiser-Walczak software development chief Frank Vitz. His program allowed the computer generated surface to naturally distort a scanned-in image mapped onto it, making for a particularly convincing illusion when Jackson sticks his hand into the rippling stargate surface just prior to taking the big step. “Frank found a way of dropping CGI objects into the CGI surface that would create natural ripples along the surface,” Okun stated. “He literally spent three days in his bathtub, lying underneath the water with a scuba mask on, dropping his kid’s toys in and studying the rippling effects. The software he wrote was an advanced particle system



As the stargate fires up, a blast erupts from the center of the ring. The fluid surge – a practical effect composited digitally – was produced by pumping high-pressure air into a massive glass tank filled with water.

program that imitated the way liquid reacts.” The result was a digital meniscus that resembled liquid mercury and had the viscosity of honey. “During the process of fine-tuning, Roland asked if we could give it more of a satin feeling, with additional surface ripples – which we did.” In all, the stargate effect entailed thirty-eight shots composited digitally by Eileen O’Neill and Mary Nelson.

The flipside of the stargate effect was the actual penetration of the meniscus surface which occurs just before the explorers begin to streak down the cosmic highroad. The inspiration for the stargate plunge was Jean Cocteau’s moody masterpiece *Orphée*, a modern retelling of the Greek legend of the hero Orpheus who descended into the *Underworld* to rescue his love Eurydice from the embrace of death. In Cocteau’s film, mirrors were the gateway to the *Underworld*, and the passage was achieved by shooting actors against black as they plunged into still, clear water.

Both Okun and Emmerich recalled *Orphée* and its wondrous, mirror-like water effect, and had grand plans for updating the illusion for *Stargate*. “We planned on having the Away Team actors on wires and dunking them into a water tank,” Okun explained. “We shot a million tests and proved a thousand times over that it would work. But literally four hours before we were going to shoot, Roland and I were having lunch and we both realized that although we were looking forward to shooting the effect, we could really only use it once in the film because we had to decide whose point of view we were dealing with – and that was the James Spader character’s. So although we were rigged and ready to go, we axed the idea of the wire rig for the full-body shots. Instead, we had Spader stick his face into water in a glass tank that was four feet wide, six feet long and three feet deep. We had a camera outside shooting through one of the glass walls at about a twenty-five-degree angle to the surface, forming a perfect mirror. The problem was all the air bubbles that clung to his face. Eventually we had him stick his face into the water, wipe the air bubbles off, then pull himself out of the water – and we used that footage running backwards.”

Once through the stargate, Spader’s features were digitally streaked to suggest a journey through space and time that recalled astronaut David Bowman’s own shattering trip through the universe in *2001: A Space Odyssey*. Known as the ‘stargate corridor’ sequence, that famed 2001 effect had been accomplished by effects supervisor Douglas Trumbull using the controlled streak photography

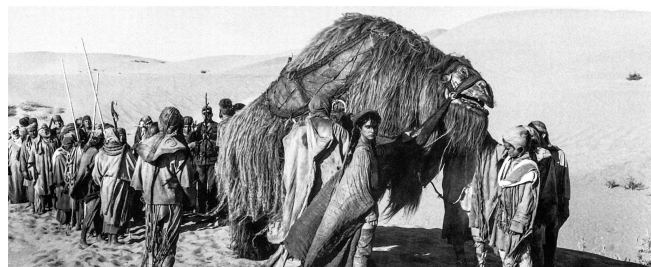
technique known as slit-scan. Many of the *Stargate* principals envisioned their sequence as a nineties version of Trumbull's hallucinatory visuals, but Okun mused that Trumbull himself would probably recreate and update that famed sequence as a simulator ride – a medium he had gone on to pioneer. Okun wanted the stargate sequence to be more than just another psychedelic 2001 knock-off. He saw it more as a tribute to Trumbull's ridefilm work.

Christened the '4-D sequence' by the Kleiser-Walczak crew, the journey through the stargate would be a computer generated, twenty-two-second film ride constructed by senior animator Jeff Williams employing Wavefront, *Matador* and Parallax software. "It's not so much what a film ride is made of that counts," Okun noted, "but the experience it puts you through. We built it up first as a ride experience and, secondly, as an environment that would enhance the ride experience. The ride aspect itself was based on the classic roller coasters that start with a great anticipation, followed by a seemingly endless fall and then incredible twists and turns."

Conceptual elements included a monochromatic blue color scheme, a cloud trail track for the viewer to 'ride' on, lens flares to add touches of red and yellow, and a starfield background designed as if the stargate traveler were inside a starry sphere. Breaks were created with scanned-in light effects, allowing the viewer to blast through three gates, underscoring a subtle story point about the stargate device itself. "Frank Vitz and I figured that each symbol you dialed in on the stargate was a switching point," Okun revealed, "like railroad tracks, so that when you travel through it you keep going through all these different gates that alter the destination of the journey. Frank drew up a map of this whole fourth dimension and, since there are so many symbols on the stargate, worked out the math for how many different combinations and destinations you could hit. We actually should have had five stargates in the sequence, instead of three, because there are seven symbols – one as the point of origin and one as the final destination, with five symbols of switching. But when we had five symbols in there it was too many. It didn't leave enough time to enjoy the travel, and we didn't have the budget to make the journey longer."

Once through the stargate, the explorers find themselves inside a mysterious temple nestled among towering sand dunes. A blazing sun and three full moons loom in the blue sky above, and behind the edifice is an enormous pyramid. Created by Kleiser-Walczak animator Mark Pompian, the wide shot establishing the otherworldly locale was a digitally composited image combining plates of a five-foot scale pyramid model with mountain and sand elements shot on location in Yuma, Arizona. Further along, the team discovers Nagada, a rock-hewed city rising from the sands, a place where thousands of workers toil in a deep quarry.

Twelve towers – fifty feet tall – were built at the Yuma location to represent part of the city of Nagada. "To hold the towers," Holger Gross explained, "we built a wooden foundation upon which we erected a skeleton of two-inch steel pipe scaffolding and super-stapled hundreds of eight-foot plywood flats – with timber bridges between the towers. At the bottom – built into the set foundation – we had wooden boxes filled with sand to weigh down the set so it couldn't be blown away in a



For shots of the desert-dwelling mastadon, trained Clydesdale horses costumed in elaborate suits enabled creature effects supervisor Patrick Tatopoulos to take advantage of natural animal movements. Facial articulations were achieved via radio control by a team of

sandstorm.” Also built full-size was the temple entrance, which would be digitally composited with a computer generated background pyramid. “The temple entrance was built in a bowl in front of a 100-foot-high sand dune. Before we began construction, we got information from locals who said the front part of the sand dune would move. It did move, but we were able to easily fill in the gaps with sand.”

four puppeteers, while a stunt rider – hidden under the suit – maneuvered the horse – and the stunt rider, the animal enforcers, Anubis and Horus, god-like figures who ruthlessly rule the desert planet. Inspired by ancient Egyptian motifs, the Anubis and Horus headgear were a conflux of costuming, creature design and articulated mechanical effects. Tatopoulos and associate Jake Garber fit the Anubis headdress onto actor Carlos Lauchu.

The surface textures of both the location and soundstage sets were designed by Gross and produced by Foam-Tec of Sun Valley, California. In an era of cost consciousness and digitally created virtual sets, the expansive constructions of *Stargate* were a welcome challenge to the foam makers, who more typically were hired to produce isolated pieces of scenery. “The sets were massive,” said Foam-Tec president John Blom. “There were 250,000 square feet of surface area. We worked with Stone Entertainment of North Hollywood, who fabricated the wooden flat substructure that held the aged adobe surfaces. We applied what we call the surface ‘skin’ to that substructure, affixing and locking it all in place with foam to blend in the seams and make it look realistic. When a foam gun is in the hands of an artist, you get amazing textures that can resemble the look of granite or obsidian or limestone.”

With the exception of the twelve towers and the temple entrance, the city of Nagada was created entirely as a digital effect by Kleiser-Walczak. Initially, Kit West and his model crew had erected a platform – 120 feet wide by 40 feet deep – in the desert in the hopes of aligning it in such a way that forced-perspective miniature buildings could be filmed against real desert dunes. When this approach failed, however, the task of building Nagada fell to the digital effects team.

From only a few model buildings, Kleiser-Walczak animator Mark Pompian digitally duplicated and flopped digitized footage to assemble the sprawling cityscape. “Nagada is layers deep,” Okun marveled. “We took the towers and city gate in the desert and digitally created the rest of the buildings.” Green-screen extras were shot milling about, chopping wood or hanging up laundry. Those elements were composited into windows and onto rooftops, along with smoke effects. “Then we scanned in elements for the dunes and some very odd, craggy background mountains that we digitally skewed so they all tilted, which provided contrast and made the dunes look more lonely and hostile.”

Sections of extras were also digitally replicated to create the look of thousands of slaves approaching Nagada for an establishing shot of the city. “I believe there were some eight hundred extras spread out over a two mile area,” Okun noted, “and we digitally replicated the crowd to four times the number of people actually there. It added a lot more depth to the shots. In the weeks following the release of the movie, I received calls from people who wanted to know where Nagada was because they wanted to go shoot there. I even had the INS calling because we had been shooting near the Mexican border and they wanted to know how we got all of those extras.”

Grazing in the sands a few dunes from Nagada is a mastadge – a hulking, hairy domesticated beast that seems to take a liking to Jackson. The production’s hero version of the mastadge was a departure from the usual animatronic creation. “For the mastadge,” stated creature effects

supervisor Patrick Tatopoulos, “I thought it would be interesting to put a suit on a horse rather than trying to make a fully mechanical creature. So we brought in some large Clydesdales.” Tatopoulos – who would also create the look of Ra and his enforcers – set up a shop in Hollywood to accomplish his varied assignments. His art department went through a dozen designs for the mastadge before Glen Hanz could begin sculpting the head, whose features resembled a cross between a camel and a cow.

The mastadge suit was designed to take advantage of the Clydesdales’ natural movements and was equipped with radio-controlled components for the head – built by Russel Shinkle – which required operation by a team of four puppeteers. “The head of the horse was actually sitting in the chest of the suit,” Tatopoulos noted. “Attached to the horse’s neck was a steel bar which created the creature’s neck – so whatever neck movement the horse did was translated to the neck of the creature. Radio-controlled eye, jaw, mouth and tongue movement were all operated by the mechanics in the head.” The entire suit was bolted to a standard saddle, with a small stunt rider – to control the horse – situated in an aluminum cage located in the haunch. Although the rider was provided guidance through radio contact with the crew, shots showing the horse at a full gallop were inherently dangerous since visibility was extremely limited for both horse and rider. The horse could only see through folds of hair in the suit and the rider had to look through slits in the haunch. The biggest concern for Tatopoulos was how the horses would react to the suit, particularly in the shifting sand and burning sun of the desert location. It took three months to train the animals, acclimating them to the heavy suit and the mechanical noises from the servos.

Under the supervision of Stuart Artingstall, the Tatopoulos shop built four mastadge suits. Additional constructs were created for specific applications, including a half-mastadge for closeup use, four background suits without radio control functions for long shots, and a miniature mastadge suit, complete with little hooves, that was worn by an Australian shepherd dog for a distant shot in which Jackson – represented by a small James Spader puppet – is dragged across the sand dunes.

In the story, Nagada is home to the descendants of ancient Egyptians who had been plucked by Ra and spirited through the stargate to the lonely, but habitable, desert planet to mine the minerals necessary to keep an alien race alive. Ra – and his enforcers, Anubis and Horus – were inspired by the deities of ancient Egypt, beings whose folkloric images have been preserved in ancient paintings and hieroglyphs. Ra – the sun god – was also considered the father of both gods and mankind, and the judge of souls. Jackal-headed Anubis welcomed and ushered the souls of the dead into the other world while falcon-headed Horus was worshipped as the winged ruler of the sky whose two eyes were the sun and the moon.

For Tatopoulos, creating the three characters would provide a unique opportunity to produce a hybrid of



costuming and creature effects. As originally envisioned for the film, the three god-like figures were in fact human pawns of an alien race, their humanity concealed from the oppressed Nagadans by magical headgear. "We were all inspired by the look of the pharaohs," Tatopoulos explained, "but we wanted to get away from what we had seen before from Egyptology. The power of Egyptian design is the simplicity, the purity of line, which works well as a two-dimensional image on the wall. But I did not feel confident extending that to three-dimensional creatures. Also, these guys had supposedly been taken from earth thousands of years ago; so they needed to look a bit like the rest of the Egyptian people, but also slightly different. Instead of copying anything, I sat down and did one drawing for each, which Roland loved. I included a kind of samurai look to Anubis and Horus, and gave Ra's headdress long earrings reminiscent of Chinese costuming."

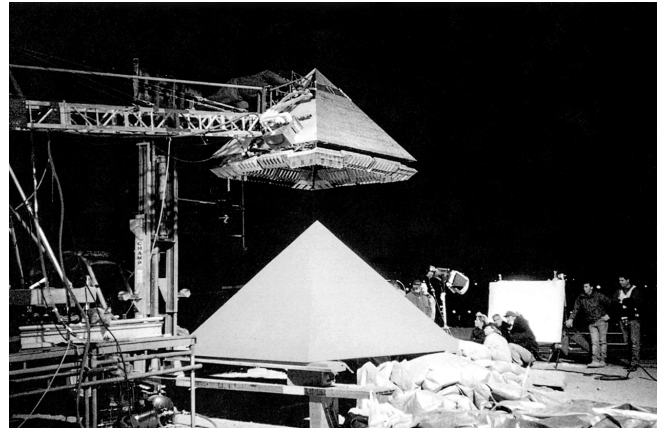
Kleiser-Walczak digital animators developed techniques to achieve shots of the headdress worn by Ra (Jaye Davidson) separating into pieces which slide into each other and disappear. The 'mecho-morph' – employed also on the Anubis and Horus helmets – used 2-D image processing and compositing techniques to create the appearance of a complex mechanical process rather than a straight digital morph.

The sun god's mask – inspired by Nubian mask art – was a straightforward foam latex piece created from a face cast of Jaye Davidson's body double. More problematic were the headdresses for Anubis and Horus, both a mixture of costume, creature design and articulated mechanical effects. "The Anubis and Horus helmets were designed like a medieval samurai helmet with a back tail, then a middle and a front section that formed a main shell," stated Tatopoulos. "This main shell was mounted on a bearing sitting on a collar piece, and the whole unit sat on the heads and shoulders of the actors to distribute the weight and help keep it from bouncing around. Atop the helmets were either the jackal or falcon likenesses – sculpted by Mark Maitre, Jim Kagel and Jake Garber – which were radio-controlled with four servos, allowing two puppeteers per creature to control functions such as the wings on either side of the helmet, the eyes and the head itself."

All of the headgear was made out of fiberglass, which tests showed would not warp in the desert sun. To provide a realistic, metallic look, Tatopoulos and key painter Mike Spatola gave the helmets an electromagnetic bath. "Painting doesn't really approach the look of real metal," Tatopoulos said, "so we decided to use a process called vacuum-metalizing. You select the metal you're interested in – copper, steel or silver – and place your object in an electromagnetic liquid bath which lays on an extremely thin layer of that metal. We dipped our fiberglass head pieces into a tank full of this liquid and a plating was applied. It really looked like metal, but was soft and light, almost like aluminum foil. Once that was done, we could age the surface with paint and it all blended together nicely."

Shots of the mechanical helmets folding up and retracting to reveal the humans within were achieved by Kleiser-Walczak. "Roland wanted the helmets to appear as though they were a mechanical device of amazing design," Jeff Kleiser noted, "as if they could fold up into themselves and disappear, all within a few seconds. We came up with an effect that was dubbed the 'mecho-morph.' Unlike a traditional morph, this effect would make it appear that the surfaces of the helmet segmented into rigid pieces and slid together mechanically – like segments of the Batmobile." Two production strategies were proposed. The first was to model the helmets using computer graphics techniques and then match-move them to the actors, animating the pieces to fold up and disappear. However, due to the complex geometry and lighting that would be required to photorealistically duplicate Tatopoulos' helmet design, that initial strategy was dropped in favor of shooting the real helmets on the actors using a motion control camera, then shooting a second pass of the actors performing the same action without the helmets and using 2-D morphing and compositing to animate the helmet pieces folding up inside one another. "Since the actors could only approximate their movement on the second take, these shots required a lot of roto-repositioning using Wavefront Technologies and Elastic Reality software."

Anubis and Horus carried spear-like sonic weapons that emitted lethal bolts of energy. Also in the service of Ra were piloted gliders equipped with similar sonic armament. Okun hired Available Light to provide the gun and glider firebolts, as well as a variety of electrical effects. "Our private name for the weapons was the 'clam guns,'" said Available Light animation supervisor John Van Vliet, "because they looked like elongated clams on a stick. The gliders were equipped with essentially the same stick guns, only they were mounted underneath the wings of the flying ships. The actual animation was sort of an organic blast with about four different layers of effects for each blast. We had a discharge effect on the side because we rationalized that when the gun opens it is powering up; then when it goes off, there is a muzzle



Shortly after their arrival, the explorers come upon an enormous pyramid. As members of the expedition take shelter during a sudden sandstorm, Ra's spaceship lowers itself onto the edifice which, it turns out, functions primarily as a giant landing platform. For shots of the arrival, technicians prepare to lower a miniature of the spaceship onto a scale model of the pyramid. Effects supervisor Kit West – tasked with providing physical effects – directed the model work and miniature photography.



Modelmaker Ann Marie Riley touches up a glider model. The wing-shaped gliders – principal weapons used by Ra to terrorize the desert dwellers – were built in varying scales and shot both on stage and in the Arizona desert. Some were mounted on stationary rigs while others were flown on wires stretched between two towers.

flash which reaches a peak with a large-scale arcing about ten feet all around. The actual blast follows – a core element that fires like a projectile and slams into whatever is being aimed at.”

Another effect provided by Available Light – one that was featured prominently in trailers for the film – was a rippling, liquid force field emanating from Ra’s hand. When striking a victim, the force field would spread in what looked like a total disintegration of the victim’s molecular structure. “We hand-animated the shock waves utilizing conventional roto techniques,” Van Vliet explained. “Then we took that artwork and scanned it into the computer where it was distorted and manipulated. For shots of the force field blasting a victim, we created a three- or four-filter effect that we stacked. And we did mattes so that the animation would expand, growing over the victim. We also hand-animated a kind of fire hose effect – flashes of stuff hitting the person. All the images had to be de-squeezed first because it was an anamorphic picture. Once we were happy with the flat image, we then had to put that 2:1 squeeze back in.” PhotoShop was used to manipulate the artwork, and the effect was composited with the live-action on a Macintosh. “Combining hand-animation with computer technology really worked well. There was the ease of creating the initial artwork by hand, with the advantages of pushing that through the computer to distort the image.”

Although computer graphics would be incorporated into some, most of Available Light’s 120 shots were accomplished the old-fashioned way with hand-rendered animation photographed on four-perf stock and composited optically. “Compositing with an optical printer is old technology,” Van Vliet observed, “but frankly, printers still make it look like it’s actually happening. They are also the most cost-effective way to do this kind of animation. Our optical printer was the real hero for us; if we had done these shots on the computer, the production wouldn’t have been able to afford it.” Optical compositing was accomplished by Beverly Bernacki who – once she received the original negative and hand-drawn elements – would typically complete her shots in three to four days. The trickiest of them included lightning effects dancing along the surface of Ra’s pyramid spaceship and lethal electrical jolts administered by him into the heads of his victims. “The pyramid lightning was difficult to manipulate so it would look hot but not lose its scale. The further away it is, the sharper it actually ends up looking to your eye.” The challenge in doing the head jolts – dubbed the ‘brain fry’ effect – was that there was little to work with in the original footage. “All we had was a closeup with the actor’s head shaking. I had to match our animation to that, frame by frame. Creating shake requires real skill on the part of the animator. It has to be drawn so there’s a major line and a minor line – like a retinal ghost – which I then have to manipulate by lining up the strip of film in relation to the taking camera and the projector, adding diffusion.”

The most formidable component of Ra’s assault force was a squadron of wing-shaped gliders dispatched from his pyramid to terrorize the Nagadians. Although some were computer generated by Kleiser-Walczak senior animator Jeff Williams, nearly ninety percent of the glider shots were accomplished by Kit West and his crew using models of varying scale built under the supervision of David Emery and Greg Stuhl. The miniature effects unit erected two forty-foot towers two hundred feet apart at the desert location, with the glider models rigged to fly between them along virtually invisible piano or tungsten wires. Manual controls at each tower allowed an operator to choreograph the practical flight – from dipping wings to barrel rolls – with West directing the air traffic from ground level. “I stood by the camera on the ground and was in radio contact with my operators,” stated West. “We were always shooting the models against sky. I’m a great believer in

using real backgrounds instead of matte paintings. As long as the gliders were against sky where you couldn't determine the distance, there was no perspective to betray the fact that they were models. For some shots we even had actors shooting up at the models as they flew by fifteen feet off the ground, with foreground explosions achieved via air mortars filled with fuller's earth."

Equally low-tech were some of the massive crowd scenes, such as the archaeological dig that opens the movie. Requiring a crowd of thousands, the scene was fleshed out with stick figures – literally sticks cemented in coffee cans with burlap costumes and styrofoam heads painted brown and outfitted with wigs. Some five hundred stick figures were positioned to augment a crowd of extras that varied in number from four hundred to eight hundred – saving the cost of digital replication for all but a few shots.

Digital technology was employed, however, as a seamless fix-it for many problem shots, including the opening of the film – an establishing view of the pyramids of Giza with a foreground that featured the Nile and a road with a car driving past. The plan was to shoot a live-action plate outside Yuma that would incorporate such elements as transplanted palm trees and an irrigation ditch simulating the river. The shot would then be digitized and composited with a two-dimensional pyramid element. "Based on mathematical calculations, the sun was supposed to set in the deep center of that shot," Okun recalled. "So, in theory, all we had to do was frame up, shoot the plate, and then, in CGI, plop in a shot of the pyramid of Giza. Unfortunately, the sun set twenty-five degrees to the left of the calculated point – completely out of frame. Panning the camera left was not an option because you would have seen a date grove, power lines and a couple of farm buildings."

Kleiser-Walczak was able to salvage the shot digitally. "Nobody will ever know this shot was one-hundred-percent CGI," asserted Okun. "We shot the basic plate at high noon, then changed the time of day to sunset – adding all the correct shadows. We also changed the water we had shot at noon to water shot at sunset, then added sun reflection highlights to it. Also, the palm trees, which had been set out weeks before, died before we did our first shot. So we brought the trees back to life in the computer by taking the drooping fronds and animating them. The pyramid itself was a scanned-in still photograph we had requested from the American University in Egypt."

Lending compositing support to the digital work in *Stargate* was Cinema Research Corporation, which used Domino – a real-time digital compositing and paint system – to complete its assignments. Although it had provided shots for a few features since its introduction in 1993, Domino got its first extensive workout on *Stargate*. It was the speed of the system that made it particularly valuable to the director and the effects supervisors. "Domino will composite a full-resolution 3K x 2K frame at between five and fifteen seconds a frame," noted CRC digital artist Mitchell S. Drain. "Other platforms can take anywhere from twenty minutes to an hour per frame. Once we've prepared a composite, we can play it back in real time at full-resolution on the high-definition monitor so it can be picked apart before scanning it out to film, as opposed to always having to work in low-resolution or look at a flip-book in the 3-D environment." Producing approximately sixty shots, CRC added occasional scleral glows to Jaye Davidson's eyes to enhance the menace of his character, composited the desert planet's three moons that had to be tracked to a moving camera, provided wire removal for some of the glider model shots and digitally incorporated practical explosion elements during the glider attack on Nagada.



Jackson fires a sonic weapon, discharging a lethal bolt of energy at an assailant. Available Light provided countless ray gun blasts for the production, as well as a variety of other traditionally animated effects.



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Ra punishes a subject with a rippling force field that emanates from his hand, spreading in concentric waves and leading to molecular disintegration of the victim. Adopting a hybrid approach to render the effect, Available Light animated the shock waves by hand using conventional rotoscope techniques, then digitized and manipulated the artwork in the computer to create the distortion.



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Okun also employed CRC for a shot of Ra's pyramidal spaceship opening at its four quadrants.

Determining that the effect – originally planned with a mechanical model budgeted at \$150,000 – could be achieved more quickly and economically in the digital realm, Okun devised a new approach that would combine plates of the pyramid model shot in various fixed positions, from closed to open, with additional plates of sand and backgrounds. "I had to take those elements and move the two-dimensional objects in 3-D space to make it look as though the pyramid was truly opening," noted Drain. "It was a very long and complex shot, about two hundred to three hundred frames, and I had to add sunlight

hitting the edges of the pyramid when it first opens and lowers down. In the background, I used the Domino color corrector to create clouds, as opposed to painting them in, because a digitally painted element would not have the same grain structure. Instead, I painted a matte element which represented the clouds and then used the color corrector to boost the light through that matte so that those clouds had a grain pattern."

Two sequences revamped in postproduction with both digital and practical tools involved teleportation and an alien creature, the latter marking an important, last-minute twist in the storyline. The teleportation effect was originally conceived as the means by which Ra and his minions were to travel through the levels of the pyramid spaceship. In consideration of production concerns that the look of the effect not mimic the famed transporter beam-up of *Star Trek*, Emmerich first conceived of a practical in-camera approach featuring teleportation rings rigged to stack up on poles, enhancing the stage effect with lights and later taking the shots into the digital realm for removal of the poles. When the practical rings ended up bouncing, however, the production was forced to cut away to avoid the giveaway glitch.

When test audiences found the teleportation scenes confusing, Okun and the Kleiser-Walczak team were called in to rework the effect. "For us, it began as a fix," Okun revealed, "but bit by bit we ended up with the whole effect. Essentially, everything had already been done. We just went in and rebuilt the shots so that Roland could sit on them longer and the audiences could better understand what was going on. We took the first ring that came into frame and replicated it so that it would look as if we had rings stacking up. Then we did a streaking on the teleported characters using Jeff Williams' particle system, adding that in behind the rings. In the end, you could see the rings stacking up and see characters physically streaking in or out." As with the cloud effects for the opening of Ra's spaceship, compositor Mitchell Drain employed his color corrector to blast light into the scene, creating a glow around the teleported characters.



For an establishing view of Nagada, plans to erect the city in miniature and film it on location using forced perspective techniques were scrapped in favor of a simpler digital approach. Kleiser-Walczak assembled the cityscape entirely in the computer, replicating footage of model buildings and compositing various other foreground and background elements into the shot.



For closer views of the city, David Emery and Greg Stuhl supervised construction of miniatures photographed on location in the desert.



Quick cuts of a glider swooping through smoke were filmed by directing a blast of smoke at a model mounted on a stationary rig. Though most of the glider shots were achieved with miniatures, some were created digitally at Kleiser-Walczak using computer animated models.

The evolution of the finale spanned all the way from the earliest design phase to near-completion test screenings. Ra was originally envisioned as an earthling taken through the stargate and installed as the mighty sun god by his alien masters. Kept alive by alien science, but having aged nonetheless, Ra conceals both his humanity and infirmity behind his masked headdress. The concept of an aged Ra, however, was revised during preproduction.

“Emmerich came up with the idea of Ra as a young, beautiful man who looked like a pharaoh,” said Patrick Tatopoulos. “Mario Kassar loved that concept and decided to try to get Jaye Davidson for the part.”

The repercussions of the revision were not apparent until the screening phase, when test audiences rejected the climax of the film in which Ra is destroyed as his pyramid ship is blown apart by an atomic bomb. Audience response made it clear that Ra was not seen as an omnipotent villain, but merely a human pawn sustained in regal power and youthful beauty by the unseen aliens. So, months after principal photography, it was decided to again transmute the character. In the final version, Ra would literally embody an alien from a dying race who had snatched up the young man and taken possession of his body. To make the story point clear, additional footage featuring an alien was needed. “The movie had been completed for about five months,” Tatopoulos recalled, “and was well into postproduction visual effects work when Roland called me and said they needed an alien. We had about a week to do it.”

Without script or storyboards, Tatopoulos created an aged version of an alien modeled after popular conception – a hairless, noseless creature with a lipless slit for a mouth. The alien took form as a foam latex rod puppet consisting of a head and torso and arms with two-fingered hands – although only the head shots would make the final cut. Radio-controlled mechanisms were used to effect the creature’s scream and slight eye and lip motions.

The alien would be incorporated into an early flashback shot and inserted into the final scene of Davidson’s body seemingly melting away to reveal the screaming creature consumed in nuclear fire. “We designed the alien life-size,” Tatopoulos explained, “but thin enough that it could conceivably fit into the body of Jaye Davidson. Because it was life-size, it could be the same distance from the camera as Jaye, making it easier to tie together the puppet and visual effects.” Tatopoulos produced both a hero head and a less-detailed, screaming head for the burn sequence that was patterned after the *Terminator 2* nuclear dream sequence in which Sarah Connor burns to a skeletal form and then explodes into ash. Though the hero alien was traditional foam latex, the burn head was made



Sculptors Moto Hata and Dave Smith prepare a life-size alien to accommodate a last-minute storyline change. Designed by Patrick Tatopoulos, and built in just one week, the alien – a rod puppet with radio-controlled facial features – was patterned after popular conception. Footage of the creature inhabiting the body of Ra was inserted for a climactic scene in which both the alien and its host are destroyed in a nuclear conflagration.

of papier-mâché. “There were about fifteen copies of the burn head,” Tatopoulos said. “We used very thin layers of pre-cut papier-mâché and filled the head with little pieces of shredded black and gray paper.” A powerful air gun was used to blow up the burn head. “We did an extra cast of the head in plasters so the visual effects people could superimpose that over the papier-mâché head and add flame effects.”

The final sequence, including the dissolve of Davidson into the alien form and the ensuing nuclear flames, was designed and executed by Emmerich, Okun and Tatopoulos, with pyrotechnic support from Joseph Viskocil. Working with Mitchell Drain at the Domino, Okun set out a program of tests which he then showed to Emmerich. “Roland gave his input,” said Okun, “then came in to approve and redirect the finals.” The effect was designed to look as if Davidson was lighting up from inside, with the alien emerging as the light intensified. The sequence ends with Ra’s ship exploding in space – an effect created on a Silicon Graphics machine by Kleiser-Walczak animator Derry Frost – then composited with elements of the ship and planet.

The success of *Stargate* and other science fiction properties in release or development indicates strongly that the science fiction genre is once again hot. Although the attraction and popularity of various storytelling genres – from hard-boiled detective fare to shoot-’em-up westerns – is often a cyclical affair, science fiction and fantasy themes are perfect vehicles for the emerging palette of digital technologies.

The interactive, digital tools employed in making *Stargate* ultimately helped the filmmakers to create seamless, invisible effects while bringing in a potential \$100 million production for half that amount. “Roland was a little resistant to CGI at first,” Jeff Okun concluded. “He was an effects person prior to directing – but he was from the down-and-dirty, in-camera effects arena. So a major part of my job as a visual effects supervisor on the film was to convince Roland that CGI could do this and that. He never just took it on faith – it was always a ‘show me’ situation. But he learned, he listened – and by the end of the production, he had expanded his beliefs about what effects can do.”

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QUICK CUTS

ANIMAL HOUSE

article by Marc Derro

Upon its publication in 1977, James Herbert's novel, *Fluke* – a charming fable about a dog who learns of his pre-canine life as a man – became an international bestseller. Among the book's most ardent admirers was Italian director Carlo Carlei, a Golden Globe nominee for his 1993 film *Flight of the Innocent*. Carlei bought the rights to the story and nurtured the project for more than ten years before it was finally produced by MGM/UA.

One of the most challenging aspects of the project was the character of Fluke himself, who is featured in nearly every scene as he matures from an inquisitive pup to a full-grown dog under the tutelage of Rumbo, his street-smart canine pal. While Fluke and Rumbo were played, respectively, by a real Golden Retriever and a St. Bernard mix – both trained by expert animal trainers Christie Miele and Dave McMillan – some scenes required animatronic replicas designed and constructed by Animated Engineering under the supervision of Dave Nelson and Norman Tempia.

Producer Lata Ryan, fresh off her stint as associate producer for *Jurassic Park*, was brought onto the project in part because of her experience in dealing with animatronics. "My immediate suggestion to Carlo," Ryan recalled, "was to take a look at some animatronic animals to use as backups to the real dogs. I'd had a great experience with Stan Winston's creations on *Jurassic Park*; and although I knew we couldn't afford Stan for this project, I did solicit his input, and he endorsed Dave Nelson. Dave had been one of the top guys at Stan's shop before going out on his own, and he had worked on the dogs in *Beethoven 1* and *2*. When I introduced Carlo to Dave, it was as if a light went off in his head; he realized that animatronics would solve many of the problems on *Fluke*."

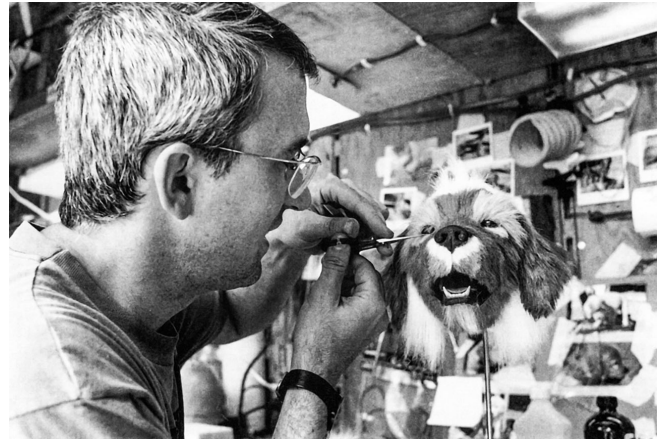
From the outset, Nelson stressed to Carlei the inherent limitations of animatronic animals. "We told Carlo right off the bat that these things would have to be stationary," Nelson said. "They would have facial movement and some body movement, but they weren't going to be running down streets. Basically, we used them to do things you couldn't do with a real dog, whether it was stunt-oriented or just an instance where a real dog would become too fatigued after awhile."

In order to authentically recreate Comet and Barney, the real dogs playing Fluke and Rumbo, the four-month-long construction process was begun by taking precise measurements of the animals. In conjunction with innumerable photographs and videotapes of the dogs, the measurements were used to create full-scale drawings. "Based on the drawings," said Nelson, "we knew the size of every part of the animal, where the joints were, and so on. From there, I could begin to build the interior mechanisms." The dog bodies were equipped with cable-actuated mechanisms for the neck, torso, hind quarters and tail. "All of the cables came out the back of the legs, which were made separately in fiberglass. The bodies were also fabricated, then covered in a carved foam musculature sculpted by Linda Notaro."

While Nelson supervised the design and construction of the puppet's mechanical assemblies, Tempia approached the artistic problem of sculpting heads that would match the real dogs exactly – a task that was complicated by the fact that the storyline required puppy versions as well as full-grown dogs. “Animated Engineering had to make several versions of Fluke,” Ryan explained. “There was a nine-week-old version, a four-month-old and a full-size one. We’d pick our real puppies as newborns, and by the time they were nine weeks old they would have changed dramatically. So Dave and his crew had to guess what these puppies would look like at nine weeks and four months. At least with the full-grown dogs, they knew exactly what they were going to look like.”

Once the heads were sculpted, foam latex skins were cast. Covering the foam latex was fur that was painted and treated to match the real dogs’ hair. Eight to ten varieties of fur were required. “There’s a lot of variation in the texture and color of a dog’s fur,” Tempia explained. “The muzzle hair on these dogs was short and light in color while the body fur was longer, darker and thicker in texture. We did a lot of research to find the correct synthetic fur so it would photograph properly and look real. An asset in this area was the cosmetics assistance performed by Gino Acevedo.”

Several animatronic heads, each with varying capabilities, were constructed to serve a wide range of shooting needs. “Some heads were packed full with servos and receivers for radio control while others used for stunts had only one or two servos,” said Nelson. “We also had the option of moving the heads by hand or by cable control. Different kinds of shots demanded different kinds of capabilities, so these dogs were made as fully modular systems. We could puppeteer the heads individually. We could choose a head and an upper torso or a head and a full torso. Also, one torso would fit three different rear ends – a lying-down one, a sitting one or a standing one. And that same torso could also be used as a hand puppet. Since all the dogs were made so they could come apart in pieces, we could mix and match those pieces, depending on the shot. It meant we could get by with building less, which was good from a budgetary standpoint and also from the standpoint of how much stuff we had to maintain on the set.”



Fabrication supervisor Norman Tempia trims artificial fur on the head of one of the animatronic dogs built by Animated Engineering to double for the canine actors in Fluke



Mechanics supervisor Dave Nelson, wearing backpack joystick controllers, articulates one of the animatronic dogs with help from his crew.

A team of four to five puppeteers was required to operate the dogs. Timing and movements were finessed during rehearsals in which the real dogs were given a series of commands by their trainers. “I operated the head and neck,” Nelson explained, “and Norman was on the mouth. Mecki Heussen – who was also our key mechanic – operated the eyes, and Mike Regan was on the ears. It was great to rehearse with the real dogs right there.”

One scene that called for a Fluke stand-in took place in a laboratory where the dog is subjected to a number of medical experiments. In the scene, Fluke is strapped into an uncomfortable harness – something the filmmakers did not want to subject the real dog to. “It was a key scene,” Nelson said, “and it was important to see Fluke there. So we put our animatronic Fluke in the harness, with the control cables coming out from the hind feet. The front legs had rods so that we could make them shift a bit; and we would move the head a little, too, just to create a sense of his movement.”

In addition to the modular hero dogs, Animated Engineering created an animatronic raccoon and several stunt dogs that had limited articulation. One such stunt double was needed for a scene in which Fluke crashes into a car windshield. “We built a body specifically for that shot,” recalled Nelson. “It had springs in the joints so that it would flex naturally upon impact.” Launched by mortar approximately eighteen times – fifteen rehearsals and three takes – the stunt Fluke had been fitted with an industrial-strength fiberglass skull in order to withstand repeated pounding against the windshield. “It was very durable,” Tempia noted. “In fact, it took out a piece of the car’s dashboard where it hit!”

A stunt version of Rumbo was required for a riverside sequence in which the deceased canine is pushed out into a watery grave by the grieving Fluke. A floating dog was constructed in three sections – hip, torso and head – each with its own removable ballast to control the buoyancy of that part of the dog’s anatomy. “The director was rather specific about how he thought a dead dog would float,” Nelson commented, “so we had to make something that could be weighted and floated accordingly. It was a theatrical thing, and it had to look the way the director wanted.”

The marriage of Dave Nelson’s mechanical expertise with Norman Tempia’s artistic abilities yielded impressive results on Fluke, establishing Animated Engineering even more securely as a company that produces top-quality animatronics. “We’ve been pigeon-holed as a company that builds realistic animals,” Nelson said, “but that is a nice little niche. A lot of companies bid on animal jobs, but there are only a few shops that can actually pull them off.”

QUICK CUTS WOOD WORKS

article by Paul M. Sammon

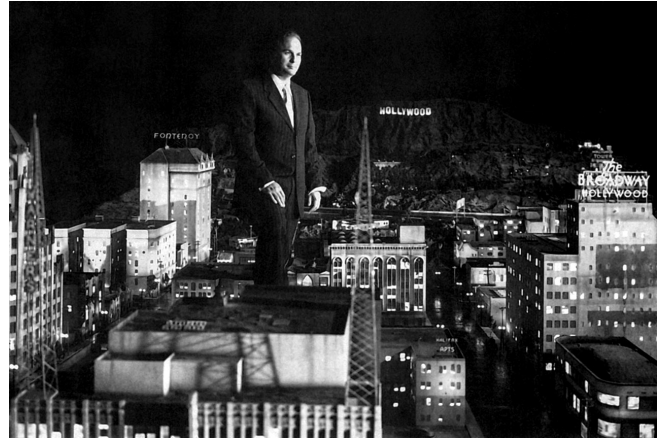
Long relegated to the ranks of cinema trivia, the films of a man once tagged ‘The World’s Worst Director’ have finally penetrated the mainstream thanks to the Touchstone Pictures production of Ed Wood. The shot-in-monochrome film biography, directed by Tim Burton, details that crucial period of the mid-to-late fifties when its title character – a charmingly inept moviemaker who surrounded himself with Hollywood fringe-folk and loved to dress in women’s clothing – made three no-budget, Z-grade pictures so comically awful that one, at least, developed a major cult following.

The visual effects of Ed Wood – consisting of elaborate miniatures and instantly recognizable icons from the Wood oeuvre – were provided by Los Angeles-based Boyington Film Productions under the supervision of Paul Boyington. Boyington was not quite prepared for the extent to which the project would require a radical rethinking of his customary approach to effects work. “By the time I was called in to oversee the effects, the picture’s look had already been established by Tom Duffield, the production designer. Our goal was to create effects that would be superior to those in a typical Ed Wood film, while maintaining the same look and sensibility. The problem was that Wood’s films had a bottom-of-the-barrel sensibility, and his chronic lack of funding inevitably resulted in an ultra-low-budget look. So my modelmakers – who are very sophisticated – had to continually recue their usual impulses and work at being primitive.”

Boyington and company commenced with the construction of an intentionally bad miniature of Hollywood for a sequence in the film in which Ed Wood (Johnny Depp), shooting *Plan 9 From Outer Space*, dangles his now legendary pie-plate flying saucers over a mockup of the city. The crude set – a tabletop miniature approximately ten feet long by five feet deep – consisted of twenty underbuilt buildings, a ragged-looking ‘Hollywood’ sign on the hillside beyond and a simple but recognizable Griffith Park Observatory. “We very much tried to copy the Woodian style by using cardboard cutouts, Christmas tree lights, wood miniatures and windows that were just holes cut in the sides of buildings – all done on a totally incongruent scale. Since Ed Wood was a practical filmmaker who worked with whatever he had at hand, we decided against using any plastic or styrene. Instead, we got down and dirty, and created something that a kid might do.”

A second miniature – a ramshackle Victorian mansion for the film’s opening sequence – was also constructed in typical Wood style. “At some point in the production,” Boyington observed, “Tim Burton, Tom Duffield and I decided that we very much wanted to incorporate key visual moments from the Wood films into the movie. The Criswell mansion was the first such homage, based on a similar shot in *Bride of the Monster* featuring the exterior of a dilapidated house with sort of low-tech rain falling on a tree branch. With input from Tim and Tom, we designed our house to have both a fairly sophisticated feel about it and a certain low-budget stylization.” Built on a scale of one-half-inch to the foot, the three-story, three-and-a-half-foot-tall miniature was constructed primarily of thin sheets of maple veneer. Each individual plank was painstakingly crafted and fitted by hand onto the model. “It was like a Victorian dollhouse. When it was done, we laid it into a sixteen-foot-square tabletop set, detailed with miniature trees and soil, and shot it on our motion control stage.”

Rain effects for the sequence required a bit of cinematic sleight-of-hand. “One of our concerns at the start of this show was how to get realistic miniature rain, since it figures so prominently in a number of the shots. Fortunately, Kevin Pike, from the first unit practical effects team, provided us with a variety of rain nozzles capable of producing miniature droplets. We set up a live-action motion control rig over a pool behind our studio – with rain rigs on towers positioned against a black cyclorama – and each night for almost a week, we shot endless rain passes with a variety of motion control moves.”



Effects supervisor Paul Boyington stands tall in Hollywood cityscape built for Ed Wood. Boyington Film Productions provided an elaborate title sequence and other miniature work for the film.

Moving through a window into the living room – where psychic Criswell (Jeffrey Jones) sits up in a coffin to deliver a comically solemn narrative on the life of Ed Wood – also proved challenging. “I’m always interested in ways to shift seamlessly from a miniature environment to a live-action one without the audience knowing where the transition has occurred,” stated Boyington. “We made a full-scale mockup of the window and placed it where the window would be in the mansion miniature. Then we did several different takes of Jeff sitting up in his coffin, using a twenty-five-foot-long boom arm on the end of the dolly. Although we could have shot it live-action motion control, Tim and the DP both saw the boom arm as delivering a look more in keeping with Ed Wood’s basic style.” Boyington took the plate of the mansion push-in that Burton chose and made a film element to bipack in his motion control camera. “That allowed us to do a match-move into our miniature window using the on-set mockup window as the end point for a seamless transition. We also matched the speed of the live-action dolly plate to create the illusion that we were flying right through the window into the living room in one continuous shot.”



Choosing traditional optical techniques for compositing, Boyington divided the work between Mike Minkow and Clay Marsh of Cinema Research Corporation and Bob Habros of Pure Light Images. “Anything that suggested digital technology would have worked against the B-movie look we were going for; so despite the cumbersome nature of the optical approach, it ultimately proved more consistent with the overall tone of the film.”

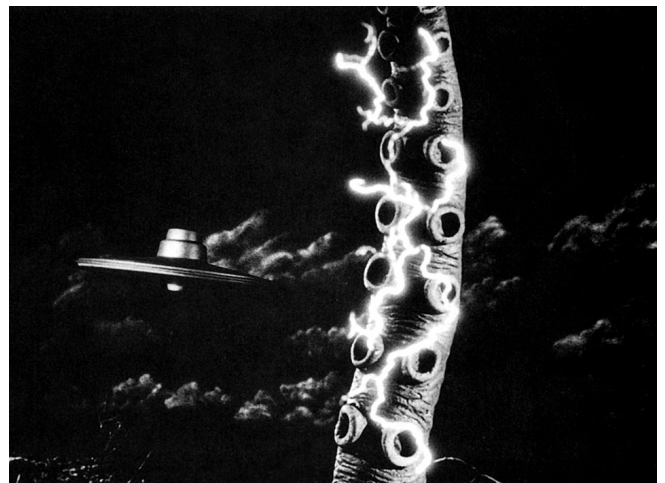
So pleased was Tim Burton with the initial miniature work that Boyington Productions was awarded two additional segments – a long traveling shot through a miniature graveyard, replete with icons from several Wood movies, and a tip-up from a miniature Pantages Theater at the film’s conclusion. Joining Boyington to design and supervise the graveyard sequence was Robert Dawson.

Shot motion control, the graveyard scene begins as the camera pushes out a rear window of the Criswell mansion down into a cemetery where the film’s opening credits are revealed on a series of tottering tombstones illuminated by lightning bolts. Measuring sixty by twenty feet, the expansive cemetery model – detailed with bushes, palm trees, mausoleums and tombstones – was painstakingly patterned after the infamous graveyard set in *Plan 9 From Outer Space*. Eighteen-inch-tall headstones were made of illustration board and inscribed by artist Tim Lawrence. “Like everything else we did in the movie,” noted Boyington, “the set was painted in black-and-white rather than color, since color shot in monochrome has a tendency to go off.”

Despite the simple set, filming the graveyard sequence required complex camerawork on the part of Alan Blaisdale. “We used a shallow depth of field,” Boyington explained, “so that if there was more than one tombstone in the composition, the viewer’s eye would be drawn to the inscription on the primary one.” Several passes were required to complete the shot. “First we did a beauty pass with all the lights on except for the tombstones which were shot at four-tenths of a second exposure time. We smoked up the stage with an oil-based cracker smoke and did another beauty pass at the same exposure rate. Next came a separate gravestone pass enabling us to separately control the exposure on the headstones, followed by several passes during which light sources were blinked on and off to create a sense of interactive lightning. We also did a lightning pass to choreograph the frames and exposures in which we wanted the lightning to occur, then programmed in a black in-between pass. That allowed the postproduction guys to put in lightning flashes at specific musical cues or at any point during our initial interactive pass.”

Following its passage over the cemetery, the camera moves on to a lagoon where a dry ice pass was shot to suggest mist drifting across the water’s surface. Diving into the lagoon, it next encounters a huge octopus reminiscent of one that appeared in *Bride of the Monster*.

Leery of the difficulty in miniaturizing water, Boyington modelmakers created their lagoon out of rippled plexiglass backlit from underneath to suggest gentle wave movement. A separate bubble plate was also shot, so that as the camera broke the surface of the plexiglass water a bubble blast obscured the soft edit segueing to forty-year-old 16mm stock footage of an octopus underwater. Boyington and Dawson paid homage both to Wood and to stop-motion animator Ray Harryhausen by including a gigantic rubbery octopus tentacle emerging from the lagoon. After studying a similar sequence from *It Came From Beneath the Sea*, Boyington turned over the task of creating the octopus arm to Mark Vialobos of Sota Effects, who fabricated a five-and-a-half-foot armature for the puppet tentacle along with a sucker-and-skin latex covering painted in black-and-white. To create a segue between the live-action octopus and the animated tentacle, the effects crew shot a motion control move off the edge of water in an aquarium, thus simulating the waterline as the camera rises above the surface of the lagoon and into the stop-motion segment. Three motion control passes were required – a beauty pass to match the one-quarter-frame-per-second tentacle animation rate, a matte pass to separate out the octopus’ arm and a final lightning pass.



As the tentacle rises skyward, it is zapped by electrical rays achieved via traditional rotoscoping by Chris Cassidy of Roto Effects of America. A trio of low-tech flying saucers – the source of the rays – swoop down to drive the tentacle away, then soar unsteadily across the sky towards a huge ring-encircled mothership. Recalling the look of the spaceships from *Plan 9 From Outer Space*, a single six-inch-diameter saucer shape – built by model production designer Jeryd Pojawa and key model builder Joshua Culp – was made out of cast resin. Mounted on a model mover, the miniature was motion-controlled by Michael Karp to appear as if it were suspended on shaky wires, giving it Wood’s trademark saucer wobble. Separate takes – each programmed somewhat differently – were then composited together to create the illusion of three saucers instead of one.

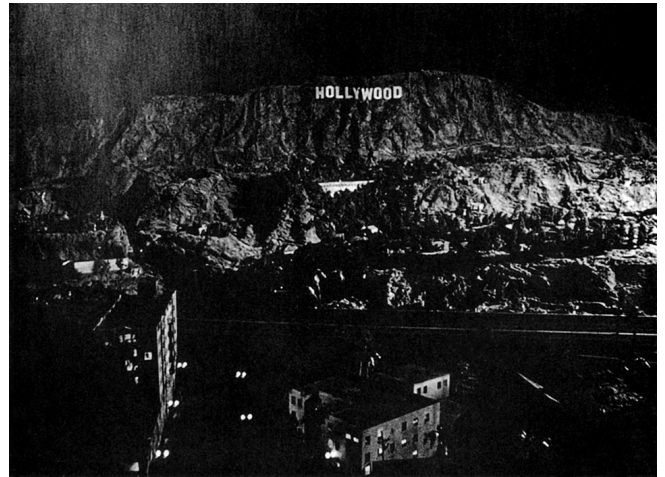
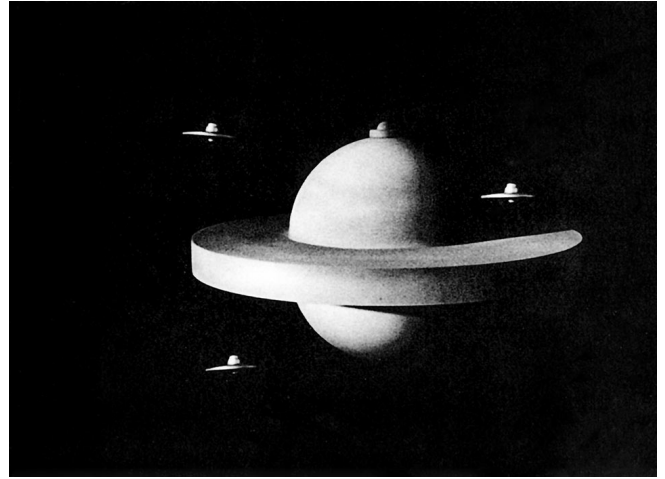
The mothership – again modeled after one in *Plan 9* – was three-and-a-half feet in diameter and made of plexiglass. To accomplish a shot of the saucers entering the ship, Boyington programmed all his moves around the stop-motion octopus tentacle surfacing from the lagoon. “The tentacle was shot in stop-motion all the way across a starfield to the place in frame where the mothership would be. The saucers were then programmed so that they would appear to be flying close to the tentacle, nearly colliding with it. The mothership was filmed as a separate element so the saucers could be matted out as they flew behind it.”

From the mothership, the camera travels past stars hand-painted on a cyclorama, drops through a cloud layer consisting of smoke elements shot high-speed and then moves back down to earth for a shot of the Hollywood sign. Resting on a miniature hillside made of crushed and textured heavy-grade tinfoil stretched over a frame of chicken wire and wood, the sign was made from styrene with individual letters etched in a wood pattern and aged to suggest weathering. The camera then pulls back, flying over a bustling nighttime Hollywood. With lead model builder Evan Jacobs overseeing construction, Boyington consulted aerial and surface photographs of the city, circa 1955, to insure an authentic look. Encompassing an area from the rolling hills of Beechwood Canyon to the Hollywood Freeway and Hollywood Boulevard beyond, the 1/48th-scale miniature measured sixty-five feet in length.

“The model filled our stage from wall to wall,” Boyington recollected. “Dotting the hills around Beechwood Canyon were dozens of little houses cast from plastic resin. Then, for the larger-scale buildings in the city, we built approximately twenty hero structures, also made from casting resin, to showcase the Hollywood of that era. Because it didn’t have the distinctive skyline that a New York City would have, we took some artistic license and created our own visual icons by moving a few of the prominent buildings all into one area. Then we added about thirty filler buildings – basically just one- or two-story flat-roofed warehouses and some generic structures.” To instill a semblance of life, miniature cars were incorporated into the model. Researching automobiles of the period, Boyington and his crew fashioned six-inch-long cast master models of a 1946 Packard, two 1944 Cadillacs and a T-Bird. The working miniatures were equipped with functional grain-of-wheat headlamps and controlled by stepper motors, situated at each end of the freeway, which pulled them along in both directions on a thin monofilament line.

The scene concludes with the camera passing above a three-and-a-half-foot-tall replica of the Warners Hollywood Theater, moving through the glare of stepper-controlled miniature klieg lights signaling a Hollywood premiere, and then down into a dark alley to reveal Ed Wood pacing in front of a theater. “Tim Burton had provided us with live-action footage,” Boyington remarked. “It was not a motion control move, so we had to match with motion control the live-action imperfections. There was no cut or dissolve or wipe – we basically came out of the model shot and had a traveling split-screen with the live-action plate. To accomplish the shot, first we plotted the live-action move so that we could recreate a model shot with the same feel to it. Then Bob Habros dealt with the split-screen, actually matting the live-action onto our subsequent miniature shot.” The miniature, a single-story, twelve-by-twenty-four-inch, 1/48th-scale version of the theater set, was initially used by the motion control programmers as a mockup of the live-action plate. “All we did was split it so that when the live-action came into frame around the top of the building, we could do a roto matte. When the camera moves down to Wood pacing in front of the building, he is actually surrounded by miniatures. The top of the building and the sides of the shot are all miniatures – the only live-action portion is the front.”

Like the opening sequence, the conclusion of *Ed Wood* required another lengthy motion control shot with a number of discreet miniature elements. The scene begins with Wood pulling away from the Pantages Theater following the premiere of *Plan 9 From Outer Space*. The camera rises in front of the theater, completes a second Hollywood flyover and tips up, coming to rest in the night sky as the end credits roll. A top-half miniature of the Pantages was built to match the bottom half of the building featured in the live-action plate. “Then we did a nodal point motion control move on both plates until we were off the live-action plate,” Boyington stated. The miniature theater, constructed by Joshua Culp, was approximately three-and-a-half feet tall and was made of plexiglass and styrene, with sandpaper, crushed walnuts and sawdust on the roof for texture. An eighteen-inch-tall marquee – also styrene – featured neon letters spelling out ‘Pantages.’ “We discovered that shooting the letters motion control at the same exposure as the beauty pass resulted in a pulsing effect, so we ended up doing long multiple exposures to eliminate the pulse.” The ending required a different Hollywood miniature than the one used in the opening flyover. Constructed from the Pantages’ point of view, the second cityscape was reconfigured to reflect the altered geography and



fitted with added buildings and hills. For the final tip-up shot, an eighteen-by-forty-foot-wide black cyclorama was erected to represent the night sky. Embellishing the shot were miniature rain effects. For the crew at Boyington Film Productions, a sense of irony pervaded the experience of creating the effects for Ed Wood. "This was a project that required the application of sophisticated technology to a low-budget concept," Paul Boyington commented. "We were never just doing satire or parody – we approached the effects very seriously, and the result was a well-crafted motion picture done in the Ed Wood style. Stefan Czapsky, the director of cinematography, perhaps said it best early on when he observed that we could make our sets and miniatures look as if Ed Wood had created them – but if they were not shot on a pretty high-end level, none of us would ever work again."

EFFECTS SCENE: FROM TATOOIN TO ENDOR

article by Mark Cotta Vaz

An enduring myth of the movies suggests that the medium immortalizes the stars whose images have flickered, larger than life, on the silver screen. But film, like life itself, can be a fragile business. Most of the great stars and movies of old are now forgotten. Many films have been irrevocably lost or diminished, from unstable nitrate-based prints gone up in flames to early color films with their once lustrous pigments now faded away.

For the films that do endure, those that haunt our cultural memory, longevity is magic. Even the surviving artifacts of the movie making process – production art, costumes and props – have a kind of talismanic allure. Consider that in recent years, director Steven Spielberg spent \$60,500 to obtain the ‘Rosebud’ sled of *Citizen Kane*, a beaded table lamp that graced Rick’s Cafe Americain in Casablanca was sold for \$12,100, and the ‘black bird’ prop from *The Maltese Falcon* was purchased for a stunning \$398,500. With high-stakes bidding for movie memorabilia at the nation’s auction blocks, coupled with film fan fascination for iconic objects produced by the medium, comes the inevitable question: “Is it art?”

Meeting that question head on, and celebrating a movie phenomenon in the process, was “The Art of *Star Wars*” – an exhibit of nearly four hundred items from the Lucasfilm collection – held at San Francisco’s Center for the Arts at Yerba Buena Gardens from December 27, 1994 to March 12, 1995. Arrangements for the exhibition started early in 1993, when Center managing director Leslie Miko approached George Lucas about the possibility of staging an exhibition of *Star Wars* artifacts. The timing was fortuitous since an exhibit of materials from the *Star Wars* and *Indiana Jones* trilogies, which had been touring museums in Japan, was returning home to Skywalker Ranch.

But the genesis of the San Francisco show had really commenced some two years before, when Renny Pritikin, the Center’s artistic director, had begun musing about an exhibition exploring Hollywood set design and art direction. “I’m very interested in popular culture and how it relates to art – and the continuing disintegration of the distinction,” observed Pritikin, who, with a staff of four, designed “The Art of *Star Wars*.” “I really wanted to make the argument that we should look at these things as sculptural objects and not as spectacle. All of the objects are meticulously and brilliantly made, but the other attraction is that people like to see what’s behind the magic curtain. They’re curious about the tricks that were played on them and how they were done.”

The 10,000 square feet of exhibition space featured separate galleries displaying models and creatures from the *Star*

Wars universe. Among them were the towering Chewbacca, Wicket the ewok, an elegant Imperial Red Guard uniform and a rebel X-wing pilot’s outfit. Also on display were the costume suit of Darth Vader, the personable droids R2-D2 and C-3PO, and a foam replica of Yoda. “I wanted viewers to have an adventure as they walked through the exhibition,” Pritikin observed, “but at the same time, there was a very deliberate decision not to have sound or video or anything kinetic, to maintain the sense of dignity an art exhibition should have.”

The exhibition also afforded visitors an opportunity to see the creative process of motion picture designers. There were concept sketches by Ralph McQuarrie and Joe Johnston that revealed the gestation and evolution of *Star Wars* characters, such as McQuarrie sketches of C-3PO, the earliest of which clearly show the inspiration of the art-deco-styled robot of Fritz Lang's *Metropolis*.

The evolution of scale models could likewise be traced in concept art and detailed schematics, prototype models such as the rebel X-wings and TIE fighters, and such iconic final pieces as the Imperial Star Destroyer and the Millennium Falcon. Matte paintings on display allowed for closeup inspection of the impressionistic brush strokes that read as photorealistic on the big screen – revealing as well such once-hidden in-jokes as the Trans-America pyramid skyscraper painted into a discreet corner of the Death Star trench docking bay. Props included lightsabers and blasters, the Gaffi stick weapon of the Tusken raiders, and the full-size landspeeder used by Luke Skywalker to jet across the sands of Tatooine.

Conceptual art, storyboards, models, creatures, props, costumes and matte paintings created and used throughout the trilogy had once been stored in any allowable space, from warehouses to the shooting site at Elstree Studios in England and the ILM shop in Marin County. During intense production periods, there was not the time to think of such objects as works of art or historical artifacts. But one spring day in 1983, shortly before the release of *Return of the Jedi*, Lucasfilm decided to stage a publicity photo of George Lucas surrounded by miniatures and creatures used throughout the series. The shoot was arranged on an ILM stage dressed out with a black backing starfield and the model of the under-construction Death Star from *Jedi* suspended in the starry space. It was the first time the objects of the *Star Wars* universe had been collected in one place; and the sight so affected Lucas that he decided right then to preserve every bit of it, a formidable task given the perishable nature of delicate models, foam puppets, glass paintings and the like.

With archivist Deborah Fine in charge, work was begun to document and preserve the material with museum-quality care. As Lucasfilm productions grew to include the *Indiana Jones* trilogy and such films as *Willow* and *Tucker*, the sheer volume of movie making artifacts, including an estimated ten thousand pieces of artwork alone, made the tasks of cataloguing and preservation a demanding, ongoing process. In 1991, a two-story building was erected at Skywalker Ranch to house both a film vault and the archival material.

The *Star Wars* exhibit at San Francisco's Center for the Arts proved a rare opportunity for the public to peer behind the magic curtain – and they responded in force. On the first day of the exhibition, fans had begun assembling at the Center's entrance well before dawn, and by the 11:00 a.m. opening, their numbers had swelled to nearly twelve hundred, many costumed as their favorite *Star Wars* characters, from Obi-Wan Kenobi to Princess Leia to Boba Fett. By the end of that first week, more than twelve thousand visitors had streamed through the galleries.

Ironically, future chapters of the *Star Wars* saga – anticipated for years, but announced only recently – will not be dependent upon the types of effects artistry on display in this exhibit. More than a decade ago, Lucas and ILM made a creative commitment to developing and applying computer technologies to film, and recent years have seen the dismantling of their optical printers, the transition of matte paintings from brush-and-paint to mouse-and-keyboard creations, and model and creature making often becoming an adjunct of computer graphics. The San Francisco

exhibition's curatorial statement emphasized the technological revolution-in-progress: "Science has rendered the objects in *The Art of Star Wars*' relics of a film past, anachronisms from the seventies, and thus has made them even more historically significant."

Many in the film industry will no doubt take exception. There are, of course, numerous effects houses and artists turning out exemplary work employing traditional paintings and models, hand-drawn animation effects, puppets and stop-motion techniques, bluescreen photography and good old-fashioned optical printing. But computers are a fact of life – whether a saving grace to some or just another tool to others – and even ILMers shake their heads at the quickening pace of digital discoveries, the breakthroughs once thought years away, already here.



*Among hundreds of items on display in "The Art of Star Wars" were concept paintings by Ralph McQuarrie for *The Empire Strikes Back*.*

Evolving technologies aside, exhibits such as "The Art of *Star Wars*" are evidence of a growing interest in capturing the dream stuff of the passing parade of popular culture, a step along the road to answering the question: "Is it art?" For many effects artists themselves, the work is the thing; and the demands of production and the dearth of storage space make it problematic to hang onto the work of deadlines past. Many traditional matte painters, for example, have cleaned paintings off their glass canvases to provide a clean slate upon which the next project, the next vision, could be realized.

Those very production pressures, particularly during the Golden Age of Hollywood when a handful of studios released hundreds of movies a year, can perhaps account for the lack of past preservation efforts. Much of Hollywood's heritage has been destroyed, neglected, outright sold or auctioned off. Today, however, there is a growing awareness, shared by many filmmakers, of the need to preserve the history of what is both an art form and an industry. Just as director Martin Scorsese has been a high-profile leader in recent efforts to preserve old movies by transferring them to modern film stocks, George Lucas has taken the forefront in the preservation of actual movie making artifacts.

The artifacts used in producing the *Star Wars* trilogy represent the tangible record of both an enduring movie series and the history of effects artistry in microcosm. In an age full of hyperbole, *Star Wars* is one of the few products of the popular arts deserving of being called mythic. And with the upcoming twentieth anniversary of the film coming hard on the end of the millennium, the trilogy is a kind of touchstone, a way of looking both backwards and forwards. "I think part of the attraction of *Star Wars* is that toward the end of the century people get very metaphysical," Renny Pritikin observed, "and I think we've seen a little bit of fin de siècle anxiety. People are asking what is the meaning of life and are we alone. They're looking to understand the human role in the cosmos."

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